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TROPICAL DISEASES BULLETIN

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BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN

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SUMMARY OF RECENT ABSTRACTS *

III. MALARIA †

General

A report on malaria terminology has been drawn up by COVELL, RUSSELL and SWELLENGREBEL (p. 996) and published by WHO. It should be most useful to all workers on the subject.

BRUCE-CHWATT (p. 901) has constructed a diagram of the relationship of epidemiological factors (including environment) in malaria, which is designed for teaching purposes.

YOUNG (p. 900) sums up and discusses the progress made in the study and control of malaria in the last 10 years; the paper should be read in full.

RAO (p. 999) discusses malaria control and population pressure. GILROY (p. 1000) notes that on certain Assam tea estates the birth rates have risen considerably in recent years, but he does not attribute this rise to the effective malaria control which has been exercised. Maternity benefits are given to female workers and may have had a bearing on the increased rates.

WILSON (p. 999) reports on the work done at the East African Malaria Unit in 1952, which comprises training of personnel, entomological research and survey and control work.

Epidemiology

MACDONALD (p. 871) has studied the form of curve in malaria epidemics, and has analysed it mathematically, relating the course of epidemics to the density and longevity of anophelines or the anthropophilic index, and to the length of the extrinsic cycle. He discusses variations in incidence other than annual variations; these are periodic, long-term or irregular, and he makes the point that very small changes in the essential transmission factors can cause long-term variations. There is the possibility of local extinction of the disease as a result of minor changes in husbandry. Non-periodic outbreaks occur within the distribution of highly anthropophilic vectors, but are usually due to obvious gross causes, or occur on the margin

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1953, v. 50. References to the abstracts are given under the names of the authors quoted, and the pages on which the abstracts are printed.

† For previous articles on malaria in this series see the March issues of the *Tropical Diseases Bulletin* each year since 1939.

of their distribution. He sets out a mathematical statement relating to his analysis, and this is followed by a note on the epidemiology of malaria by ARMITAGE (p. 890), comprising mathematical formulae relating to the infection rate in mosquitoes and the effect on the human infection rate.

An outbreak of malaria in a home for old people in Holland is described by VAN SOEST and VAN THIEL (p. 80). In former times malaria was a serious problem in the area of Charente-Maritime on the west coast of France, but after about 1888 it died down. BONNIN *et al.* (p. 79) in the last 15 years have found *P. vivax* in 34 patients, all locally acquired. *Anopheles maculipennis* can still be found. TISCHLER (p. 1002) records his observations on malaria in Montenegro in 1944. He details the anophelines found and their breeding habits, and the methods adopted to control them. EICHLER (p. 671) has recorded his observations on malaria and anophelines in Greece.

Malaria is endemic in Teneriffe, but at a low level; ROBAYNA GALVAN (p. 998) shows that *A. sergenti* and *A. hispaniola* are found.

In Ibadan, Nigeria, the largest city in West Africa, REED (p. 182) found that the proportion of infants showing malaria infection rose sharply after the third month; the infants had intermittent attacks of the disease, resulting in much debility. Infant mortality is believed to be about 350 per 1,000 births, the common causes of death being diarrhoea and convulsions.

In Lagos, BRUCE-CHWATT (p. 596) examined parturient women, the infants born to them, and the placentas, for malaria parasites. No congenital malaria was found, but parasites were present in 27·4 per cent. of the women and 22·3 per cent. of the placentas. Parasite rates in the first 3 months of life were lower than in the remainder of the first year; primary untreated malaria caused little loss of weight in most infants, which is taken as a sign of transient passive immunity. Autopsy records indicate that malaria is the cause of death in 2–14 per cent. of children up to adolescence, and it is estimated that 35,000 children under 15 die of malaria each year in Nigeria. The author has made a most useful assessment of the importance of malaria in a heavily infected area. In 9 of 96 infants who died in hospital in Leopoldville the cause of death was considered to be malaria (VAN HOOF *et al.*, p. 184). Infants under 3 months showed no evidence of malaria.

West African babies gain in weight normally for the first 6 months of life, but growth is then usually retarded. After a trial of prophylactic antimalarial drugs JELLIFFE (p. 1121) concludes that malaria is probably not the main factor interfering with growth at this age.

Malaria is not common at a centre in Costermansville, Belgian Congo, where PEEL *et al.* (p. 5) found parasite rates up to 5·7 per cent.

A survey of malaria in the Bobo-Dioulasso area revealed moderate endemicity with occasional hyperendemic areas; *P. falciparum* predominated but *P. vivax* and *P. malariae* were found. HOLSTEIN (p. 901) shows that *A. funestus* is the commonest and most important vector, with sporozoite rates up to 9 per cent. *A. gambiae* is less common, but shows rates up to 13·2 per cent. and *A. rufipes*, though not numerous, must be accounted important, with rates up to 8·4 per cent.

BLACK (p. 1000) reports a malaria survey of the British Solomon Islands Protectorate, where the disease is usually common.

CHARLES (p. 373) carried out a malaria survey in the Leeward and Windward Islands, where *A. aquasalis* is believed to be the vector, possibly reinforced by *A. albimanus* in the Leeward Islands. The climate makes transmission perennially possible though local factors produce intermissions. Epidemics have occurred. Control by residual insecticides should be possible.

Malaria still occurs in the United States in people who have had no

opportunity to acquire it elsewhere, but the numbers are now very small (Welch and Quinby, p. 6). In a note on the now very few indigenous cases of malaria in the United States Fritz and Andrews (p. 902) comment that although there have been many relapses of *P. vivax* malaria in men from Korea, they have produced very few secondary cases.

Unti (p. 1001) describes the malaria situation in the State of São Paulo, where DDT has been used, apparently with success. In the State of Rio Grande do Sul, Brazil, malaria has largely been controlled by the use of DDT, chloroquine and the destruction of Bromeliads, but di Primio (p. 1002) shows that some remains in the north-east where *A. cruzii* is the vector, breeding in Bromeliads.

Transmission

May (p. 174) has published a map of the world distribution of malaria vectors, which includes more than 50 species.

Viswanathan *et al.* (p. 673) have carefully evaluated the accuracy of hand catching in estimating the density of anophelines in India. This method revealed rather less than one-third of the total anophelines shown by subsequent spray catch, but on that basis it is regarded as affording a reliable index of density. In East Africa, however, Gillies (p. 903) found that careful hand catching missed only 14 per cent. of *A. funestus* resting in huts.

Henderson (p. 274) discusses the general question of irrigation and the breeding of mosquitoes.

Griffiths and Gordon (p. 460) describe apparatus which enables the process of feeding by mosquitoes to be observed in the tissues of a live rodent. The work was done with *Aëdes aegypti*, which imbibes blood collecting in pools as a result of the probing process, or directly from a vessel. A considerable amount of saliva is ejected before the blood supply has been tapped; sporozoites ejected into the tissue spaces may not die and may even reach the liver, though sporozoites released directly into the blood stream are those which initiate the pre-erythrocytic stage in the liver. The authors discuss these findings.

Weitz (p. 82) discusses the preparation of sera for determining the type of blood found in insects which transmit disease to man and animals; it is important that the antisera should be highly specific. Eligh (p. 83) also discusses the precipitin test for blood in insects, noting that the titre of antisera which have been stored gradually declines. A comment is made by Gordon on a point in technique which may entail a certain risk in people working in the tropics.

Vinogradskaya (p. 1003) has made a study of the spiracles of certain species of *Anopheles*, in relation to water loss.

Anschau and Exner (p. 459) discuss the mosquitoes of Styria, including the anophelines.

In varieties of *A. maculipennis* in Gdansk the first generation begins at the end of May, the second in July, and the third in September, lasting until November (Lachmajer, p. 183).

A study of the length of life of the various larval instars of members of the "maculipennis" group of American anophelines, when exposed to a temperature of 42°C., is reported by Barr (p. 184).

In the Province of Reggio, Calabria, Italy, the vectors of malaria are *A. maculipennis labranchiae* and *A. superpictus*. In the past few years control by residual insecticides has been carried out, with diminishing incidence, but in places the anophelines can still be found in considerable numbers; a condition of anophelism without malaria is being created. The

most dangerous vector in Greece is *A. sacharovi*, and WEIDNER (p. 81) discusses the breeding of this and *A. superpictus*. The various methods of control used during the war are described.

DOW (p. 1115) writes on the mosquitoes of Persia, where the malaria vectors are *A. sacharovi*, *A. maculipennis*, *A superpictus*, *A. stephensi* and *A. culicifacies*. He describes their haunts.

In Dacca, East Pakistan, NASIR-UD-DIN (p. 250) found *A. hyrcanus nigerrimus* breeding in bamboo stumps.

WOLFS (p. 474) names the anophelines, and other mosquitoes, collected in Costermansville. BERNET (p. 374) in French West Africa thinks that two categories of anophelines are to be found, namely those with powerful flight (the larger species) and those with weaker flight (the smaller species). The larger species do not haunt places much frequented by man, and they are therefore poor vectors of malaria. . The smaller species (which include *A. funestus* and what the author calls *A. gambiae minor*, the small race) are the important vectors, but they are more easily captured and are more susceptible to residual spray. HOLSTEIN (p. 360) has written a monograph on the biology of *A. gambiae*. He believes that two biological races exist, one paucidentate, endophilic and anthropophilic, the other multidentate, exophilic and zoophilic. The first breeds in " inorganic " waters, the second in waters with a high content of organic matter.

MOORES (p. 1115) has succeeded in maintaining a colony of *A. gambiae* in the laboratory, and describes the technique adopted. HALCROW (p. 903) has noted cannibalism in larvae of salt-water strains of *A. gambiae*.

GILLIES (p. 903) in East Africa shows that the gonotrophic cycle in *A. gambiae* is 2 days, but that in *A. funestus* it is 2 days at temperatures above 78°F. and 3 days at temperatures below 76·5°F. After oviposition, most of the females appear to feed the same night. DRAPER (p. 790) in Nigeria found that the rate at which *A. gambiae* became infected with *P. falciparum* varied directly with the density of gametocytes in the carriers used for feeding; as many as 43 per cent. became infected from carriers with 101–200 crescents per cmm. Carriers are commonest between the ages of 1 and 4 years. Most carriers have less than 100 crescents per cmm.

BRISCOE (p. 1003) notes that *A. gambiae* is the principal vector of malaria in Liberia, with *A. funestus* as a secondary vector. GRJEBINE (p. 374) reports a mosquito survey of part of Oubangui-Chari, where *A. funestus* was dominant when the work was done. *A. gambiae* and other anophelines were present. On the island of Fernando Po the important anophelines are *A. gambiae* and *A. funestus* (GIL COLLADO, p. 570).

Discussing the sporozoite rate in anophelines of the Belgian Congo, LIPS (p. 8) makes the point that *A. funestus* may be a vector of malaria parasites of animals, and that sporozoites found may not always be related to parasites of man; *P. berghei* is probably not involved.

A study of the nocturnal activities of *A. fluviatilis*, an important vector in India, showed that a high proportion needed a second blood meal for the completion of one gonotrophic cycle, taking this meal either on the same night as the first, or on the following night. This greatly increases the chances of transmission of malaria (JASWANT SINGH and BADRI NATH MOHAN, p. 273). House epidemics of malaria occur in south India (and in Holland), and FRIEDMANN (p. 902) thinks that in India *A. fluviatilis* may bite 4 or 5 times a night, and that a single infected female may in this way produce a house epidemic.

KRISHNASWAMI (p. 375) has made observations on the nocturnal behaviour of *A. minimus* in Bengal; he notes that the incidence of malaria transmitted by this mosquito was reduced as a result of the use of DDT spray.

Bodies somewhat resembling sporozoites have been found in the salivary glands of *A. annularis* by Jaswant Singh *et al.* (p. 194), but they were probably fungal.

In Borneo the infectivity of *A. balabacensis* (formerly grouped with other species under the name *A. leucosphyrus*) and *A. sundaicus* is affected by adult longevity, which is conditioned by climate, and which may be balanced critically round the minimum period for acquisition and maturation of infections. Colless (p. 183) makes the point that, this being so, it should be possible to reduce malaria transmission by destruction of adult resting places. Observations were made by the same author (p. 903) in N. Borneo on the effective flight range of *A. balabacensis*, which appears to be about half a mile. Beyond this the amount of malaria carried becomes negligible.

Pictorial keys to certain anophelines of Korea and Formosa, and of Malaya, have been published by Sommerman and Foote (pp. 858, 1116). They are intended for use by public health workers.

Criteria for determining the growth stages of larvae of *A. hyrcanus* var. *sinensis* have been worked out by Shibata (p. 904). A comprehensive study of the *A. hyrcanus* group in south-east Asia has been made by Reid (p. 791). He identifies *A. h. nigerrimus* with " var. X " and *venhuisi*, and notes that it is a vector of malaria in Malaya. *A. h. sinensis*, probably harmless in Malaya, is a vector of malaria in China, but two forms seem to be included under this name in China, and further investigation is needed. Chow *et al.* (p. 475) found *A. hyrcanus* var. *sinensis*, *A. minimus* and *A. ludlowi* in southern Taiwan; malaria incidence in the neighbourhood was low.

Techniques for the rearing of colonies of *A. quadrimaculatus*, *A. albimanus* and *A. aztecus* are described by Downs and Arizmendi (p. 375).

When 53 men with malaria, after return to the United States from Korea where the infection had been contracted, were bitten by *A. quadrimaculatus*, 35 of them proved infective to the mosquito. Young and Burgess (p. 598) emphasize the danger of spread of malaria from such returned men in places where *A. quadrimaculatus* is found. *A. quadrimaculatus* and *A. freeborni* have been observed in Canada, and there is, therefore, a chance of transmission of malaria from returned servicemen, but probably only in a small area; O'Rourke (p. 474) regards the danger as remote.

Frizzi (p. 1004) has found that examination of the salivary gland chromosomes of anophelines of the *maculipennis* group is useful in distinguishing the races, and thinks that this procedure promises to be useful with *A. quadrimaculatus*, the American *maculipennis* group, and others. Cross-mating experiments indicate that *A. aztecus* and *A. freeborni* are more closely related to each other than to *A. quadrimaculatus* (Rozeboom, p. 1116).

Pappas and Ruppel (p. 673) describe a technique for rearing bacteria-free larvae of *A. quadrimaculatus*.

In their handbook of mosquitoes of the north-western United States, Stage *et al.* (p. 655) mention various anophelines, of which *A. freeborni* has been the most important as a vector of malaria. Ryckman and Arakawa (p. 375) show that *A. freeborni* may hibernate in the nests of wood rats in California.

In Mexico *A. aztecus* and *A. p. pseudopunctipennis* are both domestic in habit, resting in houses after blood meals. *A. albimanus* is less anthropophilic, and although it enters houses it does not often rest in the room where it feeds. Bordas *et al.* (p. 376) show that the first two can be controlled by DDT spray, but that *A. albimanus* is less easily controlled in this way, though some control is possible.

Senior White (p. 598) has made an extensive study of *A. aquasalis*. It is a fairly effective vector of malaria from 23°S. to the equator, is at best a very feeble vector from the equator to 10°N., including Trinidad, and is a potent vector in the Windward Islands further north. Two separate clines can be distinguished, which may merit subspecific status. In Trinidad the density of *A. aquasalis* diminishes with increase in distance from the sea. Larvae tolerate considerable salinity; shade and turbidity are unfavourable to breeding. It breeds in mangrove and salt-tolerant reed areas, but not seriously in rice or watercress areas. Breeding was found in a stream only during the dry months of the year. Adult activity is mainly crepuscular, but continues through the night; most adults rest outside during the day, in low scrub or grass. *A. aquasalis* prefers oxen and horses to man as sources of blood, and man is attacked only where these animals are scarce. This monograph contains a mass of information, carefully compiled and statistically evaluated, which must be of the greatest value. Senior White *et al.* (p. 674) have observed the swarming of *A. aquasalis*, which tended to occur at certain precisely defined places time after time, and at about one half hour after sunset.

Muirhead-Thomson and Mercier (p. 275) have made a study of the feeding and resting habits of *A. albimanus* in Jamaica, and of the infectivity of gametocyte carriers to this mosquito. In the dry season nearly all biting of man takes place outside, but in the rainy season many *A. albimanus* enter houses and feed inside, and there is considerable contact with the inner walls of houses. It appears to feed indiscriminately on man and the larger domestic animals. *A. albimanus* is the predominant anopheline of Jamaica, and is regarded as the vector of malaria, though gland infections are rarely found. Muirhead-Thomson and Mercier (p. 376) report on its selective biting habits—the important reservoir of malaria infection for *A. albimanus* is the age group 7–14. The authors report parasite rates and gametocyte carrier rates in various age groups.

In eastern Colombia *A. darlingi* is the vector, and spleen rates of 30 per cent. are common. Here residual DDT spray is effective, but Renjifo and de Zulueta (p. 7) and de Zulueta (p. 274) make the point that in some parts of the country *A. darlingi* is relatively abundant without contact with man, and here DDT is not likely to be successful.

Pittendrigh (p. 276) in Trinidad has made a study of the ecology of the two species *A. bellator* and *A. homunculus*, both of the subgenus *Kerteszia* and both breeding in association with Bromeliads. Differences in climatic preferences indicate that the two species do not compete for breeding places. Lima (p. 1117) shows how *A. cruzii* and *A. homunculus* can be differentiated in the larval stage.

Aetiology

Raffaele (p. 80) traces the history of the discovery of exo-erythrocytic schizonts of malaria parasites, including his own pioneer work on the bird parasites. He accepts the fact that these schizonts appear in the liver in human malaria, but he thinks that they develop in cells of the reticulo-endothelial system rather than in the cells of the parenchyma of the liver.

Jeffery *et al.* (p. 672) infected 14 paretic patients with *P. falciparum* sporozoites, by mosquito bite or by intravenous injection, and in one they obtained specimens of liver tissue which showed the exo-erythrocytic schizonts previously described by Shortt and his colleagues. This one patient had been particularly heavily infected, but the others, also quite heavily infected, did not show the forms in the tissue examined.

Gamonts are the merozoite precursors of the gametocytes of malaria parasites, and BRUMPT (p. 672) accepts the view that they can be differentiated from other merozoites. He has studied *P. falciparum* from this point of view, and describes in detail, but without illustrations, the forms which he accepts as gamonts. Their development must be rapid, for they were only seen in the course of one day.

GUREVITCH and LAUFER (p. 277) report *P. ovale* infection in a patient from Iraq, where it had not previously been found. ADLER and ZUCKERMAN (p. 597) discuss the strain infecting this patient. In comment Garnham notes that unusual forms of *P. vivax* are not uncommon, and hesitates to accept the diagnosis of *P. ovale*.

In a village of southern Oran AUFFRET and REYNIER (p. 595) found malaria parasites in one-third of the children, including *P. malariae*, an unusual finding so far north. Larvae of *A. turkhudi* were found.

Although between 1947 and 1950, in a very large number of blood films examined for malaria parasites in South Carolina the positive findings fell to nil, ATCHLEY (p. 182) notes that there was no reduction in the sporozoite rate in the local anophelines. The identity of these sporozoites is not known, but inoculation into animals (including man) and birds did not produce infection.

Immunity: Clinical Findings

A critical synopsis of information on immunity in malaria has been written by NAUCK (p. 904).

The technique of deliberate infection with *P. vivax*, either by mosquito bite or by injection of blood, is described by SHUTE (p. 184), who also gives an account of the course of the induced disease, and its management. RAFFAELE (p. 476) writes of the techniques used in treatment by induced malaria, noting the characteristics of the infections caused by the three common species used.

KNYVETT and SCHOFIELD (p. 997) and CRABBE (p. 998) draw attention to the importance of bearing in mind the possibility of malaria among the diseases which occur in ex-servicemen from the Far East.

In a general paper on the laboratory diagnosis of malaria WALKER (p. 8) describes a method of staining films, and discusses the development of parasites in the various stages.

VOSS (p. 905) reviews the literature on congenital malaria, and describes 2 cases in Germany, which the abstracter (Maegraith) finds unconvincing.

FUHRMANN (p. 277) discusses the blood pigment in malaria.

HUNTER and SHEEDY (p. 277) discuss the jaundice which often accompanies malaria. It may be important to distinguish this from infective hepatitis, and liver biopsy is useful in that in malaria the histological changes of infective hepatitis are not found.

MONTANARI (p. 475) writes of various atypical elements in the blood in primary *P. falciparum* malaria, which he regards as results of stimulation of the reticulo-endothelial system.

FALCONE (p. 185) discusses eye complications of malaria, quoting 3 cases in which uveitis was probably an allergic manifestation.

An attack of *P. falciparum* malaria was apparently precipitated by ACTH given to a patient being treated with diethylcarbamazine for filariasis. LOWE (p. 791) states that she had been taking suppressive pyrimethamine once each week.

Charles Wilcocks

MALARIA

Trapido, H. & Aitken, T. H. G. **Study of a Residual Population of *Anopheles l. labranchiae* Falleroni in the Geremeas Valley, Sardinia.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 658–76, 7 figs.

The malaria vector *Anopheles maculipennis labranchiae* is usually a coastal marsh breeder, but in Sardinia this species was generally distributed in the quiet water of streams. During the antimalarial campaign in Sardinia [this *Bulletin*, 1950, v. 47, 810] all water surfaces were treated as actual or potential breeding places of *labranchiae*. In the later stages of the campaign only those places where *labranchiae* were found were subjected to larviciding treatments. At the conclusion of the eradication campaign in 1950 very few *labranchiae* could be found, but there remained several fundamental problems. It was not known, for instance, whether the very small residual population of *labranchiae* would be capable of increasing when all control measures ceased.

The authors studied the anopheline population of an area of Sardinia where control measures were suspended for the 1952 season. The chosen area was the valley of the Rio Geremeas covering 84 sq. km. and was enclosed by a natural barrier of hills. The streams were marked off into tracts 250 metres long and these were searched intensively for anopheline larvae from mid-July to the end of September.

At the beginning of the eradication campaign in 1947 *A. m. labranchiae* were dominant in the Geremeas valley, but no *labranchiae* were found in 1950, or 1951. Larviciding and house spraying in this area were suspended in 1949. Between April and July 1952 *A. claviger* larvae were found consistently, some *A. algeriensis* were found in ponds at the river mouth, and a few *A. m. labranchiae* were found in the lower reaches of the Rio Geremeas on June 21st. There was no rapid increase in the population of *A. m. labranchiae*, but between July and September large numbers of *A. hispaniola* (a species not found in the anopheline survey of Sardinia in 1946) were found. The numbers of varous species of anophelines found in the Geremeas valley between July and September, 1952, are given in the following table:—

Anopheline species	*Total numbers found in 4 rivers of the Geremeas valley*
labranchiae	243
hispaniola	5,425
claviger	747
marteri	590
algeriensis	10

Conditions in ponds at the mouth of the River Geremeas were ideal for *labranchiae* larvae and although larvae of this species were found there the population did not build up throughout the summer. Two artificial pools were constructed to give conditions intermediate between those which were ideal for *A. m. labranchiae* and *A. hispaniola*. *A. hispaniola* invaded these pools immediately, later *labranchiae* became dominant and finally *hispaniola* predominated again and *labranchiae* disappeared.

Human habitations and domestic animal shelters were searched for adult mosquitoes. Only one *labranchiae* female was found in a pigsty, and a search of tall grass and sedges by the Rio Geremeas, and of rabbit burrows, did not yield any more mosquitoes of this species.

Blood smears of 185 people of the valley were examined but only one positive slide with very few parasites of *Plasmodium vivax* was found and this was thought to be an old infection.

The authors discuss the possible reasons why the *A. m. labranchiae* population did not increase and why *hispaniola* has successfully invaded a habitat formerly occupied by *labranchiae*. It is suggested that the spraying of human and domestic animal shelters with residual insecticides would affect the *labranchiae* population most, a small part of the *claviger* population and would not affect *hispaniola* at all. Similarly with larviciding, those larvae which live in still waters (*labranchiae*) would be in contact with the insecticide longer than those living in fast-flowing streams (*hispaniola*). [See also this *Bulletin*, 1952, v. 49, 479; 1953, v. 50, 909.]

C. M. Harrison

i. Krishnan, K. S. **Malaria Vectors of India.** I. *A. philippinensis* **Ludlow, 1902.** *Bull. Nat. Soc. India for Malaria and other Mosquito-Borne Dis.* 1953, Sept., v. 1, No. 5, 148–55, 1 map. [30 refs.]

ii. Krishnaswami, A. K. **Malaria Vectors of India.** II. *A. minimus* **Theobald, 1901.** *Bull. Nat. Soc. India for Malaria and other Mosquito-Borne Dis.* 1953, Sept., v. 1, No. 5, 156–63, 1 map. [31 refs.]

These 2 papers follow the same pattern. The information contained in them has been collected from published work and is arranged in a series of brief notes, accompanied by references to the works from which the data were derived. They present very condensed summaries of what is already known of these 2 anophelines, and give maps of distribution and tables of dissection records.

i. The notes on *Anopheles philippinensis* deal with distribution, general bionomics, biting times, anthropophilic indices, relation to malaria, control of adults and of larvae. There is very little about blood preferences, survival and swarming, and nothing about flight range. For control of adults insecticidal sprays have been used but reports on the effect of residual insecticides are very meagre. For larvae the only measures mentioned are naturalistic.

ii. For *A. minimus* the subjects dealt with are distribution, adult resting places, altitude, feeding times and preferences, seasons, gonadotrophic cycle, thermal death point, longevity, infection rates and control of larvae and adults. Two larval control measures are noted, the diversion of silt-laden streams into breeding places in marshes and the shading of streams combined with removal of marginal vegetation. The 2 measures for the control of *A. minimus* adults are the use of pyrethrum sprays and the residual spraying of DDT. The control method of choice in rural areas is the latter.

H. S. Leeson

Bonne-Wepster, J. [M.D.], in collaboration with N. H. Swellengrebel, Ph.D. **The Anopheline Mosquitoes of the Indo-Australian Region.** 504 pp., 176 figs. & 22 maps. 1953. Amsterdam: J. H. de Bussy. [50s.]

This volume replaces earlier works by Professor Swellengrebel on the anophelines of the Dutch East Indies and may be regarded as a 4th edition; it is completely revised and has a new title.

The general subjects discussed in the first 50 pages include illustrated

descriptions of the morphological characters which are used in the classification and identification of anopheline mosquitoes, geographical distribution, bionomics, collecting, rearing, preserving, mounting and dissection. The main contents, occupying the next 400 pages, are almost entirely concerned with systematics, for the notes on malaria infection and breeding places and habits have been considerably shortened. The number of species and varieties dealt with is 116.

From a zoogeographical point of view the Indo-Australian region is especially interesting as in this part of the world 2 regions meet. Australian anophelines are found in the Oriental region, for example *Bironella gracilis*, *B. papuae*, *B. travestita*, *Anopheles farauti*, *A. punctulatus*, *A. longirostris* and *A. bancrofti*; in the Australian region 2 oriental species occur, *A. karwari* and *A. subpictus*. Two others are of doubtful origin, *A. bancrofti* var. *barbiventris* and *A. pseudobarbirostris*.

The authors state that their monograph "is meant to be used by the medical man who has to be a malariologist in out of the way places" therefore the work is limited to a study of the adults and larvae only. Distinguishing taxonomic details of these stages are plentifully illustrated by clear line drawings and where necessary very useful special keys are inserted for the separation of similar or closely related forms. In addition, near the end of the book, full keys are provided for the identification of the females and larvae of all the species described. The book closes with a list of references to the literature up to December 1952 (plus one paper published in 1953) and a systematic index.

[Entomologists using the book will notice with regret the deliberate omission of descriptions of the eggs, pupae and pharyngeal armatures, but their inclusion would have increased the size of the book which already numbers more than 500 pages. As it is, the book will be so much in demand by those interested in these anophelines that one fears that with much handling a stronger binding will soon be needed to replace the present paper one.] *H. S. Leeson*

Smith, L. B. **Bromeliad Malaria.** Reprinted from *Ann. Rep. Smithsonian Institution, 1952*. Wash. pp. 385–98, 2 text figs. & 4 figs. on 2 pls. [22 refs.] 1953. [Publication 4125.]

This general article on bromeliad malaria is based on numerous papers already abstracted in this *Bulletin*. But it concludes with an account of current trends of field research on this problem in Brazil.

All but one of the 1,600 species of bromeliad epiphytes occur in the New World. Some species grow on the ground, but others attach to bare rocks, trees at different heights, and even to telegraph wires. The so-called tank formed by the overlapping leaves in broad-leaved species holds over a gallon of water and it is in this water that species of *Anopheles* (*Kerteszia*) breed. The adult mosquitoes have been responsible for the transmission of malaria in towns and rural areas in Trinidad and Brazil.

In Trinidad, the mosquito breeding bromeliads (*Gravisia aquilega* particularly) grows on tall quick-growing shade trees planted between rows of cacao bush. Control of malaria in plantation labourers was first attempted by pulling down the epiphytes, but their destruction was later achieved by copper sulphate sprayings. In new plantations planters are encouraged to plant the cacao in close rows for shade and to use other trees only as infrequent wind-breaks. Mango trees meet this need and their

dense foliage is not favourable for bromeliads. The vector mosquito is *A. bellator*.

In Brazil, towns have been protected by deforestation of adjacent wooded slopes, the cleared ground being available for pasture or horticulture, or for plantations of fuel timber (*Mimosa* and *Eucalyptus*). Drug treatment with chloroquine, DDT house-spraying once yearly, and occasionally herbicidal sprays of copper sulphate, have been employed and are especially suitable for rural areas where adequate deforestation is wasteful or impracticable. The vectors are *A. bellator*, *A. cruzii* and *A. homunculus*.

The Serviço Nacional de Malária of Brazil has instituted intensive ecological studies to clarify the interdependence of vector species of mosquito, bromeliad species and their tree-hosts, with a view to improving the economy and efficiency of control in the future. *D. S. Bertram*

i. Aragão, M. B., Pessoa, Elisa F. & Margem, Neusa. Novo método radioativo para marcar mosquitos. [**A New Radioactive Method for Marking Mosquitoes**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, Jan., v. 5, No. 1, 69–73, 2 figs. English summary (9 lines).

ii. Aragão, M. B. Utilização de mosquitos radioativos na avaliação do raio de vôo. [**Utilization of Radioactively Marked Mosquitoes for Estimating Flight Range**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, Apr., v. 5, No. 2, 137–43, 4 figs. English summary.

i. Adult mosquitoes (*Anopheles* (*Kerteszia*) sp.) bred from larvae kept in water treated at 1/20,000 to 1/100,000 with thorium nitrate were examined up to 2 months after emergence by autoradiographic techniques. No evidence of the marker was obtained with whole specimens but tracings of *alpha* particles were identified, particularly in the malpighian tubes in dissected or sectioned specimens, and in incinerated remains. Exposure of the photographic emulsion (or plate) to the radioactivity of the specimens was effected over several days at low temperature. The figures are photographs illustrating the results obtained.

The methods, photographic materials and reagents used are described in some detail.

ii. This paper extends the work of the first paper. Larvae of *Anopheles* (*Kerteszia*) were collected from breeding places in bromeliads and bred out in artificial containers containing 1 : 10,000 thorium nitrate. This was done in a hut in a forest and several catching stations were established up to 800 metres from the hut. About 11,000 larvae were collected for treatment in this way. The radioactive element was detected in adults captured as far as the furthest collecting point. The method of detection involved incineration of the mosquitoes and autoradiographic determination of the trajectories of *alpha* particles after 30 days' exposure of the remains against photographic plates. *D. S. Bertram*

de Andrade, R. M. Observações hidrobiológicas sôbre o *Anopheles tarsimaculatus*: I.—Relações com alguns organismos planctônicos. [**Hydrobiological Observations on *A. tarsimaculatus*. I. Relationships to the Presence of Some Forms of Plankton**] *Rev. Brasileira Malariologia*. Rio de Janeiro. 1953, Jan., v. 5, No. 1, 95–107. [46 refs.] English summary.

The English summary appended to the paper is as follows:

"The author presents some results of observations made from October

1950 to September 1951, on the relation between larvae of *Anopheles* (*Nyssorhynchus*) *tarsimaculatus* (= *aquasalis*) and the plankton forms in water collections (ditches), in the vicinity of the Instituto of Malariology, Duque de Caxias county, state of Rio de Janeiro, Brazil.

"Larvae of *tarsimaculatus* were more frequently found in collections without blue-green algae (*Cyanophyta*) or algae of the genus *Spirogyra* (*Chlorophyta*) but frequently co-existed with the algae of the genera *Euglena* (*Euglenophyta*) and *Closterium* (*Chlorophyta*). Diatoms (*Chrysophyta*) were present in nearly all water, with or without larvae of *tarsimaculatus*."

Jonchère, H. Évolution de la thérapeutique et de la prophylaxie médicamenteuse du paludisme. [**Development of Chemotherapy and Chemoprophylaxis of Malaria**] *Rev. Coloniale de Méd. et Chir.* 1953, Dec. 15, v. 25, No. 219, 216–26.
A general review.

Walker, A. J. & Reid, J. A. **Resistance to Proguanil in the Gametocytes and Pre-Erythrocytic Forms of** *Plasmodium falciparum*. [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 580.

A Malay patient with *P. falciparum* malaria still showed some ring forms in the blood after 8 days of treatment with 0·4 gm. proguanil daily: the rings reappeared on the 13th day, 3 days after reduction of the daily dose to 0·1 gm. At this time gametocytes were plentiful and from the 18th day the authors therefore fed laboratory-bred *A. maculatus* on the patient for 3 successive days; the peripheral blood contained about 500 gametocytes per cmm. By then the patient had received a total of 4·8 gm. proguanil in 18 days and was still having 0·1 gm. daily. Seven to 18 days after feeding 25 of the mosquitoes were dissected: 19 were shown to be infected, 12 with sporozoites in the glands.

Before dissection and 15–18 days after the infective meal, 19 of these mosquitoes were applied on 2 successive days to 3 European volunteers who had never had malaria. Five of these mosquitoes took blood, two of them twice. Four had gland infections. All 3 volunteers developed malaria within 12 days. One volunteer had received 0·1 gm. proguanil daily for 3 days before the infecting bites, on the 2 days of biting and for 10 days thereafter. Proguanil was present in his urine throughout, including the 11th day when parasites were first found in his blood.

For some time workers in Malaya had suspected that strains of *P. falciparum* with proguanil resistance in the asexual blood forms are likely to be resistant at all stages of the life cycle: the present observations confirm this and it is hoped to publish fuller details later.

H. J. O'D. Burke-Gaffney

Zuckerman, A. **Residual Immunity following Radical Cure of** *Plasmodium berghei* **in Intact and Splenectomized Voles** (*Microtus guentheri*). *J. Infect. Dis.* 1953, May–June, v. 92, No. 3, 205–23, 3 figs. [24 refs.]

It has previously been shown [this *Bulletin*, 1951, v. 48, 21; 1952, v. 49, 671] that the vole, *Microtus guentheri*, is susceptible to infection with *Plasmodium berghei*, which produces in it a benign and transient low-grade parasitaemia, with complete recovery after several weeks. The eradication of the parasites can be demonstrated by the absence of relapse following splenectomy and by failure to infect mice with the tissues of cured voles.

It was also demonstrated that the immunity is efficient only in the presence of the spleen.

In the present paper an account is given of the results of experiments on the immune reactions during and after the development of acquired immunity. For this purpose, after the initial infection with *P. berghei*, 45 voles were superinfected (once or repeatedly) and splenectomized in varying order, during or after acquisition of immunity in advanced latent infections. The experimental manipulations in different groups, following initial infection and the establishment of latency, were as follows: (1) single superinfection; (2) two successive superinfections; (3) as preceding, followed by splenectomy; (4) as preceding, followed by superinfection; (5) splenectomy; (6) as preceding, followed by superinfection; (7) as preceding, followed by 2nd superinfection

A detailed account is given of the results. In intact voles, a single or two superinfections revealed a marked degree of residual immunity. If voles, which were splenectomized late in latency when the infection was chronic or cured, were superinfected some weeks later, it was found that the immune mechanisms had been retained in them. Among the voles which had recovered at the time of splenectomy and were then superinfected, some died of acute parasitaemia; in others a rise was followed by a fall to the chronic state, while in others again superinfection resulted immediately in latency. In the first case the acquired immunity had disappeared, in the second the initial advantage gained by the parasites was subsequently checked by the immune mechanism, while in the third the acquired immunity remained unimpaired. The persistence of low grade parasitaemia in these voles after superinfection, though indicating a lower degree of resistance than in similarly treated intact animals, pointed to a significant degree of residual immunity following recovery.

It was also shown that if splenectomy was preceded by hyperimmunization, the rate of survival among voles subsequently superinfected was higher. *C. A. Hoare*

Pérez Reyes, R. & Peláez, D. Estudios sobre hematozoarios. IV. Comportamiento de una cepa de *Plasmodium relictum* en palomas. [**Study of a Strain of** *P. relictum* **in the Pigeon**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, June, v. 13, No. 2, 111–20, 3 graphs. [14 refs.]

The English summary appended to the paper is as follows:—

"New data about one strain of *P. relictum* are pointed out; this strain was isolated from a pigeon naturally infected in 1950. The characteristics of this strain are: 24 hours for the length of its asexual cycle; simultaneousness of the schizogony; the presence of abundant exoerythocytic forms, chiefly in the brain and kidney; the average of merozoites in mature schizonts are from 7·43±0·162 at the seventh day to 11·03±1·365 at the thirteenth day. The infection in the following mosquitoes *Aedes aegypti*, *Culex quinquefasciatus*, *Anopheles albimanus* and *A. quadrimaculatus* was not attained.

"In the hypothesis of being a different strain from the other well known ones, the provisional designation of 1E has been given.

"Some considerations, concerning the course of the infection and the resistance of some animals to this strain, have been pointed out."

TRYPANOSOMIASIS

Maillot, L. Notice pour les cartes de répartition des glossines en Afrique Equatoriale Française. 1°—Carte de répartition des glossines de l'A. E. F. (2 feuilles) [Drawn by M. Arnal & J. Dauteloup]. 2°—Carte de répartition probable des sous-espèces et variétés de *Glossina palpalis* [Drawn by J. Dauteloup]. [**Maps Showing Distribution of Glossinae in French Equatorial Africa. 1. Distribution of Glossinae. 2. Probable Distribution of Subspecies and Varieties of** *G. palpalis*] Travaux de détermination effectués à l'Institut Pasteur de Brazzaville de 1947 à 1952. 6 mimeographed pp. & 3 coloured folding maps. [12 refs.] 1953. Office de la Recherche Scientifique Outre-Mer. Institut d'Etudes Centrafricaines.

These maps are specially constructed and boldly printed on tough white paper. The first, which is in 2 sheets, shows the distribution of 12 species of *Glossina* in French Equatorial Africa including French Middle Congo, Gabon, Oubangu-Chari and Chad, but no distribution is shown in the Cameroons. Both sheets are on a scale of 1 : 2,000,000; the north sheet measures 3 ft. 9½ in. × 2 ft. 1 in. and the south sheet is 2 ft. square. The symbols and colours employed are those adopted by the Brazzaville Conference in 1948. A useful feature is the ringing in red of widely situated localities where species with a scattered distribution have been encountered, and the joining up of these rings by lines, each line bearing the name of the species concerned. By this device the discontinuous distribution of such rare tsetse can be readily noted. The use of such rings and lines would be impossible on small-scale maps and, even on maps such as these, they would lead to confusion in the event of the records becoming more numerous. The 12 species shown are *Glossina palpalis*, *tachinoides*, *caliginea*, *pallicera*, *newsteadi*, *morsitans*, *tabaniformis*, *fusca*, *haningtoni*, *fuscipleuris*, *nigrofusca* and *schwetzi*.

The second map (1 sheet) shows the distribution of the subspecies and varieties of *G. palpalis* in the southern part of the country roughly between Franceville and Brazzaville. The forms shown are *G. palpalis palpalis*, *G. palpalis fuscipes* and *G. palpalis fuscipes* var. *brazzaville*. The scale of this map is 1 : 1,000,000 and the size of the sheet is 1 ft. 10 in. × 2 ft. 0 in. A small key map is printed on this sheet indicating the position of the relevant regions of Africa.

The mimeographed note which accompanies these maps gives an account of the circumstances which led to their compilation and a brief explanation of their contents with references to the sources of information.

H. S. Leeson

Perlowagora-Szumlewicz, Alina. Ciclo evolutivo do *Triatoma infestans* em condições de laboratório. [**Life Cycle of** *T. infestans* **in Laboratory Conditions**] *Rev. Brasileira Malariologia. Rio de Janeiro.* 1953, Jan., v. 5, No. 1, 35–47, 2 figs. [20 refs.] French summary.

By breeding *Triatoma infestans* in the laboratory at 24°–28°C., adult bugs have been obtained as early as 2½ months after the first-stage bugs have hatched from the eggs. Current policy for the control of *T. infestans* recommends a single treatment of houses per year with BHC. This is partly based on field results but also on laboratory data which gave much

longer periods (220–240 days) for the development of the bug. The present findings suggest that treatment once a year may incur risk of inadequate control. The figures are graphs showing the growth of the bugs through the difference stages up to that of the adult. *D. S. Bertram*

See also p. 324, Zeledón, Manifestaciones alérgicas consecuentes a la picada de triatomas. (Hemiptera, Reduviidae.) [**Allergic Reactions Following Bites of *Triatoma dimidiata***]

LEISHMANIASIS

Calero M., C. & Johnson, C. M. **Cutaneous Leishmaniasis in the Republic of Panama.** A Report of Twenty-Five Cases. *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 628–33, 3 figs. [12 refs.]

The first case of cutaneous leishmaniasis was reported in Panama by Darling in 1910, but since that time little attention has been drawn to this disease, until fairly recently. Hitherto a total of 32 pathologically confirmed cases has been reported: the authors now add 7 more acute confirmed cases, as well as 18 others in the cicatricial stage in which the diagnosis was clinical.

The onset was always a localized pruritic and erythematous lesion, " resembling an insect bite " and 5 of the 7 patients actually saw an insect biting them. [It would be unlikely that they would see a sandfly biting.] All the lesions occurred on exposed parts of the body: each had from 1 to 7 lesions. In 3 superinfection on other parts of the body occurred from the primary lesion. In 4 cases the lymphatic vessels were involved and non-ulcerating nodules occurred along the course of these vessels. The typical ulcer that formed had a " granular base and a thickened, elevated, undermined border ", and varied in diameter from 2 to 12 cm. In no case was there any mucosal involvement. Secondary infection was active in 3 cases but had been controlled by local treatment in the remaining 4 cases: in the latter the ulcer became flatter and the edges lost their undermined character.

As the ulcer healed the scar was at first pink and tended to be scaly: later it became smooth and glistening and developed a hyperpigmented edge. [No reference is made to the nature of the treatment.]

A table is given showing the sites and nature of the lesions and certain epidemiological data. All the subjects were farmers, except 2 who acquired the infection while " hunting ". Four were sowing, 5 harvesting, and 14 clearing jungle when they were infected. The months of infection were from January to August.

The authors conclude that the disease is much more common in Panama than was hitherto supposed. *L. E. Napier*

FEVERS OF THE TYPHUS GROUP

Schäfer, W. Statistische Untersuchungen über Fleckfieberkurven. [**Statistical Investigation of Typhus Fever Curves**] *Ztschr. f. Hyg. u. Infektionskr.* 1952, Nov. 17, v. 135, No. 6, 548–56, 1 fig.

This article deals with the construction of " control charts " based on the notifications of cases of typhus in Poland in 1929–38 and 1941–43. The areas concerned, to the east of the Vistula, were not so much affected by the war so that the comparison between the 2 periods is quite valid. In 1929–38, incidence was highest in the spring; in 1941–43, it was at its maximum in summer. In 1941, typhus was more widespread even than in 1932.

" Control charts " which give an indication of the usual seasonal trend of the disease and of the limits of random deviations from it are constructed from the monthly number of cases in the 13 four-week periods in each year between 1929 and 1938. The tendency to spread during each period is based upon the percentage increase in the number of cases between one period and the next. The control line of the expected 4-weekly number of cases follows the means of the years between 1929 and 1938. Some variability round this mean expectation is inevitable, but deviations from it are assessed in terms of the variance of individual years round the grand mean. In practice, epidemic conditions are said to exist when a 4-weekly case total is more than 2 standard deviations above the expected value for the appropriate period of the year. Schäfer believes that the tendency to spread as measured by the percentage increase from one month to the next is of even greater importance than the absolute number and he derives similar control limits for charts of this percentage over the epidemic season. When the rate of increase oversteps the upper control limit, the indications are that preventive measures have failed. Again, the success of subsequent control schemes designed to counteract the epidemic spread can be assessed by comparing the trend in the number of cases and percentage change with the standard expected level for the following months. The experience in 1943 was typical of a successful reversal of an ominous deviation beyond the control limits.

D. D. Reid

Whitney, Dorothy M. & Anigstein, L. **Effect of Cortisone on Experimental Rickettsioses and on Antibody Formation.** *Texas Reports on Biol. & Med.* 1953, v. 11, No. 3, 561–9. [19 refs.]

In the experiments described, the administration of cortisone to rabbits or guineapigs during the process of immunization with the antigens of fevers of the typhus group caused a low degree of suppression of antibody formation as judged by the titre of the complement-fixation reactions and the degree of immunity produced.

In one set of experiments, 11 guineapigs were given injections of 12·5 mgm. of cortisone and inoculated with " typhus " (presumably epidemic) 24 hours later and then were given 25 mgm. of cortisone daily for 11 days. Within 1–4 days of inoculation high continued fever developed and lasted 10–20 days; the animals were later found to be immune. In other experiments rabbits were given daily doses of 10 mgm. of cortisone at the same time as a course of 5 intravenous injections of 0·2 ml. of Lederle epidemic-typhus vaccine over a period of 14 days. The average complement-fixation titre 14 days after the first dose of vaccine was 1 in 50 as compared with

a titre of 1 in 93 in 6 control animals immunized in the same way but not treated with cortisone.

The conflicting findings of other workers who have studied the effect of cortisone on rickettsial infections in man and animals are discussed but no definite conclusions are reached. *John W. D. Megaw*

Silva-Goytia, R., Vasquez Campos, H. & Elizondo, A. Estudios sobre fiebre manchada en México. V.—Incidencia de anticuerpos específicos para *Dermacentroxenus rickettsi rickettsi* en grupos ocupacionales de diversas áreas geográficas. [**Studies of Rocky Mountain Spotted Fever in Mexico. V.—Incidence of Specific Antibodies of** *Dermacentroxenus rickettsi rickettsi* (*Rickettsia rickettsi*) **in Groups of Persons of Different Occupations and in Different Areas**] *Medicina.* Mexico. 1953, Sept. 25, v. 33, No. 684, 425–35. [51 refs.] English summary.

A survey with complement-fixation tests was carried out in 5 states of Mexico. The antigens used were of 2 strains of *Rickettsia rickettsi*, one isolated in the Bitter Root Valley of Montana, the other a locally isolated strain of the same organism.

Sera of 3,225 persons were tested. The percentages of reactions, at titres of 1 in 8 to 1 in 64 or over, varied in the different areas from 5·4 to 27, being highest in the northern part of the country. In the area most thoroughly surveyed 2,197 sera were tested; of these 374 (17 per cent.) were positive including 54 at titres of 1 in 64 or over. The percentages of reactions in the different age groups did not show significant variation; the highest was 18·1 in the 21–30 group, the lowest was 14·9 in the 41–50 group. The percentage among males was 20·6 and among females it was 15·2. The incidence among agriculturists was 20·3 per cent.; among domestic workers 15·2 per cent.; among schoolchildren and others it was 17·9 per cent. The geographical distribution of the reactors corresponded closely with that of reported cases of the disease, and the relatively large number of reactors suggested strongly that most of the cases in the area had been inapparent, abortive or ambulatory.

Among the sera tested in this area 1·9 per cent. reacted with antigens of epidemic or " endemic " typhus, the actual number of reactors with the former was 21 and with the latter it was 22. *John W. D. Megaw*

Germer, W. D. & Glokner, B. Epidemiologische Q-Fieberstudien in Württemberg-Hohenzollern. [**Epidemiological Studies of Q Fever in Wurttemberg-Hohenzollern**] *Ztschr. f. Hyg. u. Infektionskr.* 1953, v. 138, No. 1, 56–65, 3 figs. [25 refs.]

The authors describe a survey of the incidence of complement-fixation reactions for Q fever among the population of an area of Württemberg-Hohenzollern where numerous outbreaks of Q fever had occurred in 1947–48 and steadily diminishing numbers of cases continued to occur till 1951, since when only a few sporadic cases were reported. Tests were made of sera of 77 persons known to have been attacked 2–5½ years ago; 56 of these cases occurred in 1947–48. Among 24 persons whose illness had been mild or moderately severe 11 gave negative responses, 9 had titres of 1 in 16 to 1 in 32 and 4 had titres of 1 in 64 to 1 in 256. Among the 32 severe cases only 3 were negative, 15 reacted at 1 in 16 to 1 in 32 and 14 at 1 in 64 to 1 in 512. Among the 21 persons whose attacks occurred in 1949–51

the reactions were on much the same lines; 10 were negative and 4 reacted at titres of 1 in 64 to 1 in 128.

Among 53 guineapigs inoculated intraperitoneally with a strain of the organism the reactions were very consistent; the titre began to rise 4–5 days after the onset of the fever, the maximum titre was reached about the 25th day and then there was a gradual decline to a lower level.

In a general survey of the region, reactions of 1 in 16 or over occurred in 23 of 88 persons tested in the affected areas, in 4 of 78 cattle, and in 10 of 31 sheep. In the areas where no cases were known to have occurred the corresponding findings were 39 of 364 persons, 97 of 922 cattle and 3 of 35 sheep. *John W. D. Megaw*

BARTONELLOSIS

Giroud, P., Le Gac, P. & Tournier-Lasserve, C. Mise en évidence et fréquence des bartonelles dans le sang des rongeurs du Haut-Oubangui appartenant aux espèces: *Mylomys cuninghamei alberti, Epimys rattus frugivorus, Rattus mastomys coucha, Lophuromys sikapusi, Dasymys incomtus fuscus* et *Taterillus emini*. [*Bartonella* **Infection among Rodents in Upper Oubangui**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 5, 663–4. [10 refs.]

Rats play an important rôle in epidemiology in Europe and one more important still in the tropics where they breed more abundantly and are subject to a multiplicity of infections, and ectoparasites are common, especially the genera *Trombicula, Schöngastia* and *Schöngastiella*.

Systematic examination of the blood of rodents in Upper Oubangui revealed many parasites, but the authors were particularly struck with the prevalence of *Bartonella*. Thus, of 57 rodents captured in the canton of Langandi 25 were found infected: in detail, 17 positive among 34 *Rattus r. frugivorous*, 3 of 6 *R. mastomys coucha*, 2 of 5 *Lophuromys sikapusi*, and 1 each of 4 *Mylomys cuninghamei alberti, Dasymys incomtus fuscus* and *Taterillus emini*. Selecting those most heavily parasitized the authors were able to pass on the infection once only to white mice by means of the blood and spleen tissue. They will make trial, however, of splenectomized mice. They conclude that they have not been able to adapt laboratory-bred mice to the infection present in wild rodents. *H. Harold Scott*

YELLOW FEVER

Kirk, R. **Recent Advances in Tropical Medicine. No. V.—Yellow Fever.** *West African Med. J.* 1953, Oct.–Nov.–Dec., v. 2 (n.s.), No. 4, 169–80, 2 figs. [41 refs.]

A general review.

Floch, H., Durieux, C. & Koerber, R. Enquête épidémiologique sur la fièvre jaune en Guyane française. [**Epidemiological Study of Yellow Fever in French Guiana** *Ann. Inst. Pasteur.* 1953, Mar., v. 84, No. 3, 495–508, 1 map. [15 refs.]

Throughout the 18th and 19th centuries, French Guiana was ravaged by yellow fever epidemics, but with the exception of 2 cases in 1909, no case

has been reported since the epidemic of 1901–2. The authors enquire whether this is because the state of endemicity which had existed for 50 years no longer exists.

The high *Aëdes* index of 80, found by one of the authors at Cayenne in 1945 and 1947, showed that the vector was still abundant. By yellow fever protection tests carried out from 1934 to 1949 in British and Dutch Guiana the existence of a permanent source of yellow fever virus was revealed in the forest zone; it was assumed that a similar source existed in the adjoining French territory. The following results are quoted:—

British Guiana (1938 and 1939): 506 examined, 185 (37 per cent.) positive [this *Bulletin*, 1940, v. 37, 90; 1941, v. 38, 67].

Dutch Guiana (1938 and 1947): forest dwellers, 78 males and 48 females examined, with 26 and 4 per cent. respectively positive. Other local people, 42 males and 16 females examined, with 29 and 25 per cent. respectively positive [*ibid.*, 1947, v. 44, 993].

In 1951 the Pasteur Institute, Cayenne, collected 531 specimens of blood from various ethnic groups of the coastal and forest zones of French Guiana and obtained the following evidence of immunity:

Coastal zone ...	397	68 positive	17 per cent.
Forest ,, ...	134	47 ,,	35 per cent.
Total	531	115 ,,	21 per cent.

Analysis revealed that the positive rate was higher in the forest zone than in the coastal, among males than females, and among the older than the younger inhabitants. The 1951 rate of 17 per cent. in the coastal zone was higher than that of 1934 (2·7 per cent.) because of the number of elderly people having experienced the previous epidemics of 1887–88 and 1901–2. The number of positive results among the younger people might be due to their having acquired immunity at an early age in the adjacent forest zone. The rate of 35 per cent. in the forest zone was due to exposure to the permanent source of infection.

A map was made (and appears in the paper) showing the areas where contact with the virus was possible and, by noting the ages of children with antibodies in their blood, it could be calculated when the yellow fever virus had been present: *e.g.*, in the Maroni Basin villages of Ponta, Assici and Apatou, 3 Boni children aged 15, 5 and 4 years respectively gave positive results, and it was concluded that the yellow fever virus had circulated in these 3 villages since 1939, 1946 and 1947 respectively. Similar deductions were made for the coastal zone.

The authors finally concluded that (a) yellow fever is endemic in French Guiana, although no case has been reported for 40 years, a situation similar to that in Surinam and British Guiana, and (b) there is a permanent yellow fever risk in French Guiana, the source of which is the yellow fever of the jungle which covers almost the whole of the country. The presence of the howler monkey *Alouetta stentor* in the jungle helps to maintain the sylvan cycle of yellow fever.

The vector, *Aëdes aegypti*, was found in great numbers along the seaboard, and this factor, combined with the ever present source of virus in the forest, constituted a menace to the Guianese people. However, the DDT residual spraying campaigns carried out in 1949 and 1950 by the Pasteur Institute, Cayenne, as part of the Panamerican Sanitary Bureau's scheme for eradication of *Aëdes aegypti* from the Caribbean, have brought about its complete eradication in French Guiana, as inspection in May 1951 revealed [this *Bulletin*, 1953, v. 50, 9]. Large-scale vaccination supplemented this campaign, and thus the danger of infection by yellow fever virus has been greatly reduced.

The authors compare the situation with that in French West Africa, another endemic yellow fever area, where vaccination has been compulsory since 1941, and where there has been a marked decline in yellow fever as a result. *R. Ford Tredre*

RABIES

SMITH, C. E. G. **A Red-Green Contrast Stain for the Routine Demonstration of Negri Bodies in Brain-Tissue Sections.** *J. Path. & Bact.* 1953, July, v. 66, No. 1, 309–10.

The method described by the author, from Malaya, is said to be simpler and more consistent than such methods as those in which eosin, methylene blue or fuchsin are used.

Slices of brain tissue 1 or 2 mm. thick are fixed in Zenker-acetate for 12 to 24 hours, washed in running water for 6 to 8 hours and embedded in paraffin. When the sections are brought down to water, mercury salts are removed with iodine and thiosulphate. The sections are then stained for 20 minutes in a solution containing Fast Green FCF, 0·1 gm.; glacial acetic acid 0·2 ml.; ammonium acetate, 5·0 gm.; distilled water, 100 ml.

After washing in tap water, the sections become bluish-green: they are then differentiated in 1 per cent. HCl. in 70 per cent. ethyl alcohol until almost all the green colour is removed—this process is fairly slow, but the endpoint may be readily determined with practice. The sections are then counterstained for 5 minutes in 1 per cent. Safranin O in distilled water containing 0·2 per cent. glacial acetic acid. The excess safranin is removed by thorough washing in tap water and the preparation, after dehydration, is mounted in Canada balsam or a neutral medium.

Negri bodies, which are stained bluish-green, may be seen easily with the 16 mm. objective: with the 1·8 mm. objective characteristically arranged vacuoles may be seen. The erythrocytes are green, without vacuoles, microglial nuclei and nucleoli of nerve cells are bright red, and the cytoplasm and general background are pale pink or grey.

It is pointed out that the aqueous Fast Green will stain brain tissue satisfactorily only in acid solution and in the presence of the ammonium ion. Any soluble ammonium salt is effective, but the hydroxide may be used only before the stain is applied as alkalis decolorize Fast Green FCF.

Practical points mentioned are that formalin and Bouin's fixative are not as satisfactory as Zenker-acetic although they produce less distortion. Badly fixed or partly autolysed material gives poor results. Instead of slices, the brain may be fixed in bulk and thin slices then fixed for shorter periods. Although Fast Green FCF is recommended for staining, it is added that light green or aniline blue may be used. An interesting observation is that aniline blue gave a better contrast for one worker who is partially red-green colour-blind. *H. J. O'D. Burke-Gaffney*

ZLOTNIK, I. **A Selective Method for the Staining of Negri Bodies in Histological Brain Sections.** [Correspondence.] *Nature.* 1953, Nov. 21, v. 172, 962.

The author writes from the Veterinary Research Laboratory, Blantyre, Nyasaland. Because of the capriciousness of some of the staining methods for Negri bodies he has been using a modified Heidenhain's method, with

very good results. Nevertheless, the greyish-black background and the black staining of other structures may cause confusion in differentiating them from the Negri bodies, which stain blue-black by this technique.

The author has therefore evolved a method based on LENDRUM and MCFARLANE and MCFARLANE'S modifications of the picro-Mallory method (*J. Path. Bact.*, 1940, v. 50, 381; *Stain Technique*, 1944, v. 19, 29). The technique was originally devised for staining connective tissue, but the principles have been applied in demonstrating Negri bodies.

The sections are stained in Ehrlich's haematoxylin for 5 minutes and "blued" in tap water for 2 minutes. They are then stained in 0·5 per cent. Orange G in saturated aqueous solution of picric acid for 1 minute and thereafter washed in tap water until only the erythrocytes stain yellow. After rinsing in distilled water, staining is carried out for 10 minutes in a solution containing 0·5 gm. acid fuchsin, 0·5 gm. phosphotungstic acid and 100 ml. of 1 per cent. acetic acid. After further rinsing in distilled water differentiation is carried out for 5 minutes in the following solution:

Phosphotungstic acid 2 gm.; Phosphomolybdic acid 2 gm.; Saturated aqueous sol. picric acid 70 ml.; Absolute alcohol 30 ml.

Rinsing is then effected in distilled water and in 1 per cent. acetic acid. The preparation is finally stained in 1 per cent. aniline blue in 2 per cent. aqueous acetic acid for 15 minutes, rinsed in 1 per cent. acetic acid, dehydrated, cleared and mounted.

Negri bodies stain purplish-red with blue granulations, the cytoplasm of neurones is bluish, nucleoli dark purple and erythrocytes yellow.

It is stated that this staining method is selective, durable and constant.

H. J. O'D. Burke-Gaffney

SEATON, S. P. **Rabies treated Unsuccessfully with Oxytetracycline.** A Case Report. *Southern Med. J.* 1953, Nov., v. 46, No. 11, 1120–21.

"A case of rabies in a seventy-two-year-old man is reported. Oxytetracycline was not effective in the ordinary dosage when the disease had developed."

TAGAYA, I., OZAWA, Y. & KONDO, A. **Studies on the Purification of Rabies Virus. I. Application of Methanol Precipitation and Two Other Methods.** *Yokohama Med. Bull.* 1953, Apr., v. 4, No. 2, 78–86.

After briefly reviewing methods applied by previous investigators to the purification of rabies virus—adsorption on kaolin, precipitation by acid and by protamine sulphate, ion exchange resins—and observing that the application of such methods did not appear to have achieved any very considerable degree of purification, the authors record in the present paper the results of their attempted purification of the Nishigahara strain of fixed virus by means of methanol, acid, and portamine sulphate precipitation tests respectively.

Before performing these tests, however, the authors had considered it essential to examine the influence of 4 organic solvents (benzene, toluene, petroleum ether, and ethyl ether) on the infectivity of rabies virus—this because of the fact that the removal of lipids by such means from crude suspensions of virus-infected brain had been frequently tried by previous workers, with a view to securing a higher degree of purification of the virus. The results of the authors' experiments in this connexion confirmed the findings of WRIGHT, BELL and HABEL [this *Bulletin*, 1949, v. 46, 732] that the effect of such treatment is a marked reduction in the potency of the virus. Having thus determined that the use of solvents of this nature

as a primary step in the purification process was contraindicated, the authors then, without preliminary treatment of the brain suspensions, carried out precipitation tests with the reagents indicated above. Their main results and conclusions are summarized below:

(1) *Methanol precipitation.* Rabies virus can be purified to a certain extent by this procedure, namely, by precipitating the virus with cold methanol (chilled to −18°C.) in a concentration of 25 per cent. and eluting the precipitate with 0·1 m. phosphate buffered saline solution (*p*H 7·4). Repeated treatment proved to result in a great loss of infectivity of the virus; activity was reduced to 1/100 of the original suspension by one precipitation and to about 1/10,000 thereof by repeated treatment, while about 87 per cent. and 99 per cent. or more N were removed respectively. The great loss of potency so caused suggested that purification by this method is entirely unsuitable.

(2) *Acid precipitation.* Rabies virus can be purified by repeated acid precipitation at *p*H 4·6 (adjustment made by adding McIlvaine's citric-acid phosphate buffer) and eluted in buffered saline solution at *p*H 7·0. The greater part of the virus was found to have been precipitated by this treatment, although a certain amount appeared to have been inactivated during the process. Repeated treatment caused a negligible loss of infectivity, with greater decrease in N content. Thus the precipitate of the first precipitation showed for the mouse a virus potency, as calculated by the Reed and Muench method, of LD50 = $10^{-4\cdot2}$, as compared with one of $10^{-5\cdot5}$ in the control suspensions prior to treatment, and a 73·7 per cent. removal of N, while that of the second showed figures of $10^{-4\cdot2}$ and 92·5 per cent. respectively. Acid precipitation appeared, therefore, to give more satisfactory results of partial purification of the virus than methanol precipitation.

(3) *Protamine precipitation.* Protamine sulphate precipitated a part of the virus, but almost the same degree of infectivity was shown in the supernate ($10^{-2\cdot8}$). Moreover, the greater part of the virus seemed to have been inactivated during the process (potency fell from LD50 = $10^{-5\cdot5}$ in the control to one of $10^{-2\cdot2}$ in the precipitate). This method was, therefore, not considered a suitable one for purification. *G. Stuart*

Yaoi, H. **Recent Advances in the Preparation of Anti-Rabies Vaccines: Inactivation of the Viruses by Merzonin and Heat.** *Yokohama Med. Bull.* 1953, Apr., v. 4, No. 2, 97–119. [18 refs.]

This paper details the method of preparing merzonin-vaccine and makes a comparison, based largely on the results of the author's laboratory investigations, between the immunizing value of merzonin-vaccine and that of other vaccines employed in the prophylaxis of man and dog against rabies.

Merzonin-vaccine is prepared by suspending in normal saline (of *p*H 7·2 to 7·6) 10 per cent. of finely ground guineapig brain infected with the Nishigahara strain of rabies fixed virus, and, after adding the organic mercury compound merzonin in a quantity sufficient to achieve a 0·1 per cent. concentration, exposing the whole to a temperature of 37°C. for 5 days, so as to ensure complete inactivation of the virus. In this preparation the titre of the brain tissue must be of at least LD50 = 10^{-6} mouse dose. The finished product maintains its potency unimpaired for at least 12 months, when kept at ordinary cold room temperature; moreover, potency is not appreciably affected by storage at a room temperature of 18°–23°C. for 3 months.

For the prophylaxis of man, merzonin-vaccine, with a potency of not less than 5,000 LD50 protection titre (estimated by the Habel test) is administered intradermally in a dosage of 0·2 cc. on each of 10 consecutive days. Apart from local reactions at the sites of inoculation, ill effects of treatment have been noticeably absent. Among 1,000 persons treated, however, there was one case, in a 54-year-old male, of serious neuroparalytic accident. In contrast, the author states that, among 5,530 persons treated in Japan by the Pasteur dried cord method between 1947 and 1949, there were 37 (0·67 per cent.) neuroparalytic accidents, with 6 deaths. Further, whereas of 32 persons bitten by rabid dogs on face, head or neck, 7 developed rabies despite treatment with Pasteur's vaccine, there was no fatality among 47 persons who had been similarly bitten and had been treated with merzonin-vaccine. With respect to rabicidal antibody response in persons treated with Pasteur's vaccine and merzonin-vaccine respectively, the author has shown that, as regards the rate, degree of production and duration of such antibody, the Pasteur vaccine fell far short of the merzonin. By the end of treatment with the latter vaccine, for example, rabicidal antibody was readily demonstrable, the neutralization index (N.I.) of the serum being at least 100, while 4 or 5 days thereafter the N.I. was 1,000 or more; moreover, antibody proved to be still present in appreciable amount 1½ years after treatment. On the other hand, the rabicidal antibodies in man treated with Pasteur's vaccine were, as a rule, late in appearing and very small in amount; their duration was relatively short.

Prophylactic immunization of dogs by means of merzonin-vaccine would appear to be in the experimental stage. Experimental evidence, however, based on the rabicidal antibody response of dogs to merzonin-vaccine with a potency = 66,800 LD50 protection titre, and on the results of resistance to intracerebral challenge with street virus by dogs 4 weeks after treatment with merzonin-vaccine (potency = 871,000 LD50) and with ordinary phenolized vaccine (20 per cent. brain tissue in 0·4 per cent. phenol, with a potency = 61,660 LD50) respectively, has confirmed the author's belief in the efficacy of merzonin vaccine for the active immunization of dogs and other animals. It was found also that a higher degree of protection was afforded by giving 2 doses of the vaccine, at one week's interval, than by giving one single dose, and that the same degree of protection followed intradermal injection in one-fifth of the dosage used for subcutaneous inoculation. Up to 3 cc. may be given intradermally in the abdominal region.

The following points are included in the author's summary:

(1) To prepare the highly antigenic merzonin-vaccine the brain tissue employed must be of at least LD50 = 10^{-6} mouse dose.

(2) The merzonin-vaccine for human prophylaxis must possess a protection titre of at least 5,000 LD50, as estimated by the Habel test.

(3) Questions as to how great should be LD50 protection titre of a vaccine, and as to the total amount of that vaccine and the number of doses to be used for human prophylaxis, may be answered best by an evaluation of the rabicidal antibodies in the treated person's serum on definite dates after the commencement of treatment, *e.g.*, 100 N.I. on the 10th day and 1,000 N.I. or more on the 14th day.

(4) The potency prescribed by the present Minimum Requirements for anti-rabies vaccine of not less than 1,000 LD protection titre should be greatly elevated. Were the standard raised to 100,000 LD50 protection by the Habel test, "two-dose" initial immunization and "one dose" booster injection every half year should ensure the complete prevention of rabies in dogs. *G. Stuart*

Nikolitsch, M. Die Hodogenese des neurotropen Virus. [**Alternative Neural Pathways for Neurotropic Viruses**] *Arch. f. Hyg. u. Bakt.* 1953, v. 137, No. 5, 317–26, 4 figs.

The English summary appended to the paper is as follows:

" If injected I.M. into one of the hind-legs of the rabbit, the neurotropic virus of Aujeszky's disease reaches the brain despite the fact that the spinal cord had previously been bisected high up in the lumbar region. The time after which the virus reaches the brain is, however, always considerably delayed as compared to the controls. The phenomenon of the constant delay excludes the general circulation of the blood as a means of transmission. It must therefore be assumed that the neurotropic virus penetrates into the brain from the periphery also via the autonomous nervous system."

PLAGUE

Heisch, R. B., Grainger, W. E. & d'Souza, J. St. A. M. **Results of a Plague Investigation in Kenya.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 503–21, 1 map. [19 refs.]

This is a detailed report of an important investigation into plague occurring among wild rodents and their fleas in Kenya. A brief note on the first part of the study has already been published [see this *Bulletin*, 1953, v. 50, 110]. The area most closely studied was the Rongai plain situated at a height of about 6,000 feet in the Rift Valley. Plague was first detected early in 1952 among labourers living in huts on a farm. The huts were promptly dusted with Gammexane and DDT which proved very effective in controlling the outbreak. The chief findings in the first survey of the area in January to March 1952, have been stated in the abstract mentioned above. Few domestic rats were found and among the 42 *Rattus rattus kijabius* that could be caught none was found infected. The chief rodents were, *Arvicanthis abyssinicus*, 660 (10 infected), *Mastomys coucha*, 456 (4 infected), *Otomys angoniensis*, 221 (2 infected) and *Rhabdomys pumilio*, 61 (2 infected). Only 2 of the fleas caught on these rodents were found infected, one strain of *P. pestis* was recovered from a pool of *Dinopsyllus lypusus* collected in an *Arvicanthis* burrow containing 3 desiccated corpses; the other strain was found in a pool of *Xenopsylla cheopis* found on the dead body of a domestic rat.

In the second survey made in Rongai in February and March 1953, *R. rattus* was almost completely absent; among the 38 that could be caught and the 7 fleas found on them no infection could be detected. The wild rodents were greatly reduced in numbers; 188 *A. abyssinicus* and 382 of their fleas (mostly *X. cheopis*) were examined; *P. pestis* was found only in one flea. A strain was found among 134 *O. angoniensis* but none in the 672 fleas (also mostly *X. cheopis*) found on them. A strain was found among the 30 *M. coucha* and another among their 114 fleas (*X. cheopis* and *D. lypusus*).

A survey was made in July and August 1952, in Keruguya, an " old silent focus " where plague had once been severe but had not been known to occur for the last 15 years. The chief rodents were *R. rattus* (827 with 1,564 fleas, nearly all *X. brasiliensis* and only 8 *X. cheopis*), *A. abyssinicus* (49 with 15 fleas), *M. coucha* (5 with 6 fleas) and *O. angoniensis* (78 with 41 fleas). Pools of all the rodents and their fleas were tested but no infection was found.

The Rongai epizootic was thought to have originated among *A. abyssinicus*, which swarmed in a maize field, and to have spread from them to *R. rattus* in numerous farms and so to human beings within a radius of about 10 miles. It was concluded that wild rodents must have been the primary reservoir of infection at Rongai, the chief animals implicated being *A. abyssinicus*, *M. coucha* and *O. angoniensis*; *R. rattus* was regarded as being infected secondarily in all cases.

The susceptibility of various rodents in Rongai to inoculation with *P. pestis* was tested during the epizootic period in April 1952, and again during the enzootic period in April 1953. The results are shown in the table.

	April 1952		March 1953	
Species	Number tested	Survival, in days	Number tested	Survival, in days
R. rattus	4	14, 4, 14, 18	3	4 in one case, the other 2 rats survived
A. abyssinicus	8	18 to 36	10	4, 4, 7, 44, the others survived
M. coucha	7	15 to 37	1	survived
O. angoniensis	2	10, 16	7	4 to 9
Taterillus sp.	4	3, 3, 3, 3	—	—
R. pumilio	8	3 to 5 except for one that died after 25 days.	—	—

The authors agree with Baltazard *et al.* [this *Bulletin*, 1952, v. 49, 1041] who regard the more resistant wild rodents as the important reservoirs of plague, the highly susceptible domestic rodents being unsuitable for carrying over infection in the interepizootic periods because they tend to be almost exterminated during epizootics.

[Although the findings are consistent with this view they do not exclude the possibility that infection may sometimes be carried over by the few surviving resistant domestic rats and their fleas. In some of the few *R. rattus* tested in the above experiments there was evidence of the occurrence of a high degree of resistance; for example, in 2 of the 3 tested during the enzootic period. Further investigation is needed before it can safely be assumed that commensal rats are of no importance in maintaining infection.] *John W. D. Megaw*

Seal, S. C. **Studies in** *Pasteurella pestis*, *Pasteurella pseudotuberculosis* **and their Variants. Part I. Growth, Morphology, Salt Stability and Biochemical Reactions.** *Ann. Biochem. & Exper. Med.* Calcutta. 1951, v. 11, No. 3, 129–42, 4 pls. [14 refs.] **Part II. Serology-Agglutination, Cross-Agglutination, Absorption and Cross-Absorption of Agglutinins.** *Ibid.*, 143–70, 1 fig. [32 refs.]. **Part III. Serology-Precipitation.** *Ibid.*, 171–80, 1 chart. [15 refs.]

I. The author describes a study of a large number of strains of *Pasteurella pestis* belonging to 3 types: (1) virulent, (2) avirulent protective, and (3) avirulent non-protective. Several strains of *P. pseudotuberculosis* were included in the study the special object of which was to find whether there was any relationship between the cultural, morphological and biochemical characters of *P. pestis* of the above types and the virulence and immunizing

properties of the different types. The morphological and cultural features of the virulent and avirulent protective types were similar but the avirulent non-protective and pseudotuberculosis strains differed from the others in showing long thready forms, in staining more deeply, producing more opaque and rougher colonies, in producing a more granular growth in broth, in forming an unstable " emulsion " in saline and in developing no envelope substance when grown on rabbit-blood agar at 37°C.

An improved method of distinguishing motile pseudotuberculosis strains from non-motile strains is said to be by stab cultures in semi-solid agar grown at 25°C. in which the motile strains show a characteristic tree-like growth.

II. The author has found that the agglutination test for plague and *P. pseudotuberculosis* infection is greatly facilitated by using a live suspension of a young growth of the organisms on 5 per cent. rabbit-blood agar. An ideal bacterial suspension can usually be obtained with cultures of 18–24 hours' growth. Readings are best made after incubation overnight at 37°C. By agglutination and cross-agglutination tests combined with absorption and cross-absorption tests *P. pestis* was found to have at least 2 antigenic fractions, (a) a surface antigen which is protective to mice and corresponds to the $P\frac{1}{3}$ fraction referred to in previous papers [see this *Bulletin*, 1954, v. 51, 173], and (b) a somatic antigen which does not protect mice. The virulent strains and the avirulent protective strains contain both antigens; the avirulent non-protective strains contain only the somatic antigen. Details of the numerous experiments and the discussion of the significance of the findings must be sought in the original paper.

III. A precipitation test is described which gives results consistent with those obtained with the agglutination test described in the preceding paper.

The work on the test was done in 1941–42 at the Haffkine Institute, Bombay. *John W. D. Megaw*

Seal, S. C. **A Note on the Methods for the Differentiation of** *Pasteurella pestis* **and** *Pasteurella pseudotuberculosis*. *Ann. Biochem. & Exper. Med.* Calcutta. 1952, v. 12, No. 4, 123–30, 2 figs. (1 coloured on pl.). [15 refs.] With an Appendix on Methods for Differentiation of *P. pestis* and *P. pseudotuberculosis*. 130–34.

This note was presented at a meeting of the Expert Committee on Plague of the World Health Organization which met in Bombay in December, 1952.

The points relied on by various workers for differentiating *P. pestis* from *P. pseudotuberculosis* are discussed and the conclusion reached is that the methods now available " are adequate enough for the purpose " and that it is now only necessary to select suitable methods and to standardize them. Special care is essential in the choice of media for the growth of *P. pestis*, otherwise the organism is likely to undergo deterioration and to be confused with *P. pseudotuberculosis*. The methods recommended by the author are described by him in an appendix. By a misprint Brown's opacity scale is shown as Borwn's. *John W. D. Megaw*

Longanecker, D. S. & Burroughs, A. L. **Sylvatic Plague Studies. IX. Studies of the Microclimate of the California Ground Squirrel Burrow and its relation to Seasonal Changes in the Flea Population.** *Ecology*. 1952, v. 33, No. 4, 488–99, 9 figs. [10 refs.]

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

Shaffer, J. G., Sienkiewicz, H. S. & Washington, J. E. **The Propagation of *Endamoeba histolytica* in Tissue-Bearing Culture without Accompanying Bacteria or other Microorganisms.** *Amer. J. Hyg.* 1953, May, v. 57, No. 3, 366–79, 4 figs. on pl.

The authors describe experiments on the growth of *Entamoeba histolytica* in tissue culture in the absence of any other microorganisms. The following reagents were used: (a) Hanks's balanced salt solution (NaCl 8·0 gm., KCl 0·4 gm., $MgSO_4 \cdot 7H_2O$ 0·2 gm., $CaCl_2$ 0·2 gm., $Na_2HPO_4 \cdot 2H_2O$ 0·06 gm., glucose 1·0 gm. in 1 litre distilled water); (b) chick-embryo extract made of 10-day chick embryos, washed with (a), crushed through a syringe into test tubes and mixed with equal volume of (a); after standing 1 hour at 4°C. the tubes were centrifuged, the supernatant fluid was collected into test tubes and placed in deep-freeze overnight, after which they were thawed, recentrifuged, and stored in the deep-freeze until required; (c) nutrient fluid, consisting of Hanks's solution (a) 22·5 ml., horse serum 25 ml., embryo extract (b), penicillin (2,500 units) 1·0 ml., phenol red 0·1 ml.; (d) tissue substrate consisting of chick embryos (minus limbs, eyes and anterior part of head), which were ground in a mortar, and then mixed with enough nutrient fluid (c) to make a 10 per cent. concentration, after which the suspension was dispensed in 2 ml. amounts in test tubes. These were inoculated with *E. histolytica* and kept in the Brewer anaerobic jar at 37°C. for 48–72 hours, after which the cultures were examined for the presence of amoebae.

The results of 9 experiments, which are described in detail, were as follows: (1) *E. histolytica* grows better in tissues of older chick embryos (12–14 days) than in younger ones (5–9 days), but since 9–11 day embryos are easier to handle, these were used throughout the experiments; (2) the embryonic liver suspension promotes better growth of the amoebae than suspensions of brain, muscle or intestine; (3) various strains of *E. histolytica* show differences in their ability to grow in chick-tissue substrate; (4) although the amoebae could grow in cultures incubated aerobically, their propagation is best in the anaerobic jar; (5, 6) the tissue constituents alone are not sufficient to promote growth of the amoebae which require intact living cells for their successful propagation; (7) the number of amoebae grown in cultures is correlated with the concentration of horse serum added to the medium; (8) it is possible to establish propagating cultures by inoculation of only 5–6 amoebae; (9) when blocks of various chick organs and tissues were suspended in the nutrient fluid (c), the amoebae actively penetrated into some of these tissues, especially the liver, and to a lesser degree the heart muscle, but none was seen in the brain and other muscles. In the tissues invaded there was no evidence of cellular reaction around the amoebae or of any lytic action on the part of the latter. The invasion of chick embryonic tissues by the amoebae is clearly shown in the accompanying photomicrographs.

It is emphasized that in the tissue cultures described, no other microorganisms, except *E. histolytica* in "pure culture", were present.

C. A. Hoare

Nair, C. P. **Rapid Staining of Intestinal Amoebae on Wet Mounts.** [Correspondence.] *Nature.* 1953, Dec. 5, v. 172, 1051.

For correct identification of intestinal amoebae it is important to obtain characteristic staining of the nucleus. The author, writing from the Malaria

Institute of India, has observed that the *p*H of the staining solution was more important than the stain itself.

He used 3 buffer solutions on cultures or fresh forms of the common amoebae and found that at certain *p*H levels, the buffer solutions alone rendered the nuclei of trophozoites and cysts refractile, and brought out the details clearly.

For trophozoites of *E. histolytica*, the optimum *p*H with an acetate buffer was 4·0 to 4·8, with phthalate and citrate buffer it was 2·5 to 3·0. The vegetative forms also stained well with the rapid stains used (Velat's [this *Bulletin*, 1950, v. 47, 625], Quensel's [*ibid.*, 1936, v. 33, 412] and the well-known JSB stain) at various *p*H levels. For Velat's stain the optimum *p*H as 0·05 per cent. solution in acetate buffer was 4·0 to 4·8 and with phthalate it was 3·5. Solution 1 of JSB stain made from the powder form gave equally good results with acetate buffer at *p*H 3·5 and phthalate at 2·5, when used as an 0·1 per cent. solution.

It is added that simple dyes like 1 per cent. pyronine and 0·5 to 0·0125 per cent. methylene blue in acetate buffer at *p*H 3·5 produced the same results as Velat's and JSB stains. The cysts, however, needed a low *p*H (1·25 to 1·35). *H. J. O'D. Burke-Gaffney*

Chakravarty, A. **Intestinal Amoeboma. Report of Three Cases with Chloroquine Therapy.** *J. Indian Med. Ass.* 1953, Nov., v. 23, No. 2, 70–72, 8 figs. on 2 pls.

"Report of 3 cases of intestinal amoeboma is submitted herewith.

"All these cases were treated with chloroquine diphosphate and the clinical response was extremely satisfactory."

Heller, P., Korn, R. J. & Zimmerman, H J. **Amebic Hepatitis presenting as Fever of Unknown Origin.** *New England J. of Med.* 1953, Oct. 8, v. 249, No. 15, 596–600, 3 figs. [31 refs.]

"Two patients with hepatic amebiasis presenting as obscure fever are described. In both the diagnosis was established only after long delay.

"Amebiasis should be included in the diagnostic consideration of fever of obscure origin.

"The clinical and laboratory features of this disease are reviewed, with special emphasis on structural and functional changes of the liver."

Elsdon-Dew, R., Wilmot, A. J. & Armstrong, T. G. **Fumagillin in Amoebiasis.** *Lancet.* 1953, Dec. 5, 1180–81, 1 fig.

Fumagillin, it has been claimed, and in contrast to the other available antibiotics, exerts a directly amoebicidal action on *Entamoeba histolytica* [this *Bulletin*, 1951, v. 48, 640; 1952, v. 49, 696, 952]. The authors have access to large numbers of Africans suffering from acute amoebic colitis and have been able to study the effect of fumagillin and of other drugs in such patients. They show their results, and contrast them, in a table and a block graph. Their material findings are as follows:—of the 50 patients treated with emetine, by the twentieth day 50 per cent. were symptom-free, free from ulceration, and stool-negative; of 52 given aureomycin 92·3 per cent. were similar "successes" in treatment; of 50 given penicillin and sulphasuccidine 92 per cent were successes; of 7 given 40 mgm. of fumagillin daily none was relieved, but of 48 given 200 mgm. of fumagillin daily

62·4 per cent. were successes. A dose of 40 mgm. of fumagillin therefore did not control an acute attack of amoebic dysentery, but 200 mgm. of this drug daily did so as well as did 1 grain of emetine daily, but less effectively than 2 gm. of aureomycin daily. The only toxic effect of fumagillin treatment noted was a mild facial dermatitis in 14 of the 49 patients who were given 200 mgm. daily for 10 days [see also McHardy *et al.*, this *Bulletin*, 1953, v. 50, 939]; the rash appeared between the sixth and tenth days of treatment [see also this *Bulletin*, 1953, v. 50, 939, *bis*]. *A. R. D. Adams*

Konar, N. R., Sen Gupta, A. N., Bhattacharjee, S. P. & Chanda, G. **4(3'-Diethylamino-Methyl-4'-Hydroxyanilino)-7-Chloroquinoline ("Camoquin") in the Treatment of Giardiasis.** *J. Indian Med. Ass.* 1953, Nov., v. 23, No. 2, 52–4.

Camoquin [amodiaquine] (0·2 gm. tablets) was used in 28 cases of giardiasis in place of mepacrine. It is claimed that this drug freed all cases, with one exception, of the parasite and relieved the attendant symptoms. In adults and adolescents the "one shot" treatment with 3 and 2 tablets respectively proved effective and did not evoke toxic symptoms. In infants and young children these consisted of nausea, vomiting, anorexia and lethargy. At this age the best schedule was one-third of a tablet (66 mgm.) three times daily for 2 consecutive days, and this was most effective in producing a reduction in the number of stools and improvement in their appearance within two days. The clinical features of all 28 cases are shown in a table. *Philip Manson-Bahr*

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Muñoz Cosin, F. Vector y epidemiología de la fiebre recurrente hispano-africana. [**Vector and Epidemiology of Relapsing Fever of the Spanish-North-African Type**] *Med. Colonial.* Madrid. 1953, Nov. 1, v. 22, No. 5, 487–505, 2 figs. [61 refs.]

A general discussion and review.

Varela, G. & Roch, E. Infección natural con fiebre por mordedura da rata, o sodoku, de ratas (*Rattus norvegicus*). [**Natural Infection of Rats (*R. norvegicus*) with Rat-Bite Fever**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, June, v. 13, No. 2, 169–71.

The English summary appended to the paper is as follows:—
"In 83 *Rattus norvegicus* from Mexico City 3 strains of *Spirillum minus* (Carter) were isolated."

Leeson, H. S. **Some Notes on the Recorded Distribution of Old World Species of *Ornithodoros* (Acarina).** *Bull. Entom. Res.* 1953, Sept., v. 44, Pt. 3, 517–26, 4 figs. [73 refs.]

This paper brings together a great deal of information on the known distribution and on the synonomy of species of *Ornithodorus* in the Old World. Apart from records for *O. capensis* on Tristan da Cunha, *O. batuensis* in Malaya, *O. gurneyi* in Australia, and, recently, a species near *batuensis* in the Philippines, the genus is known only from the Mediterranean basin and Middle East countries, India, Ceylon, and Africa. There are

about 20 valid species, although nearly twice as many names have appeared in the literature. Four clear maps—one for the Mediterranean and Middle East countries, 2 covering this region and Africa, India and Ceylon, and one for East Africa—show, almost at a glance, the regional distribution of the species. The text contains an alphabetical list of species giving for each species the countries in which it has been found, the synonymy, and also, discussing where necessary, doubtful records and problems of synonymy. This is of no little complexity particularly regarding *O. tholozani*: it seems appropriate to relegate *asperus*, *papillipes* and *miana* to synonyms of *O. tholozani* and to concede *O. tholozani* var. *crossi* in the Punjab and var. *pavlovskyi* in Central Asia. A second list shows the species found in different countries of the Old World. Very considerable care has clearly been taken in the preparation of the maps and distributional data to assess the reliability of the records; this is particularly the case for *O. moubata* and *O. savignyi*. *D. S. Bertram*

Horrenberger, R. Contribution à l'étude du " Sodoku " en Afrique du Nord. [**A Contribution to the Study of " Sodoku " in North Africa**] *Arch. Inst. Pasteur d'Algérie.* 1953, Sept., v. 31, No. 3, 304–19. [65 refs.]

The author gives a detailed historical résumé of this disease in North Africa where up to date only 11 clinical cases have been recorded, 9 in Algiers and 2 in Tangier, and in only one of these cases was the diagnosis confirmed in the laboratory. The results are then given of an examination of the sewer rats in Algiers, undertaken during the first half of 1952, to determine the prevalence of *Spirillum minus* var. *morsus muris*, the causative agent of sodoku.

The brains of 662 rats were ground up into 74 lots each of 7 to 10 individuals, and the resulting emulsions inoculated into guineapigs. Six of these lots, representing 55 rats, all *Rattus norvegicus*, produced infection in guineapigs, an incidence of 0·9 per cent., which is far lower than most of the figures recorded in other countries—up to about 25 per cent. in Japan. It is possible, however, as suggested by Ruys [see this *Bulletin*, 1926, v. 23, 603] that these high percentages may be the result of including a non-pathogenic variety of *S. minus*.

The existence of this reservoir of infection among the sewer rats in Algiers constitutes a possible source of human cases of sodoku and, although rare, this possibility should be borne in mind in the diagnosis and treatment of any clinical symptoms following rat bites.

Edward Hindle

LEPROSY

World Health Organization. Technical Report Ser. No. 71. **Expert Committee on Leprosy.** First Report. 28 pp., 1 diagram. Geneva: 1953. Sept. (Sales agent for U.K., H.M. Stationery Office.) [1s. 6d.; $0.20; Sw. fr. 0.80.]

The Committee consisted of a group of experts chosen from a larger expert advisory panel, and representing as far as possible in a body limited to 10, the more important countries where leprosy is prevalent, and varying views regarding important aspects of leprosy. It was found possible within the short period of 9 or 10 days to come to a degree of agreement which

would have been impossible with a larger body. The following aspects of leprosy were discussed: epidemiology, control, treatment, classification, immunology and the significance of histopathological examinations. As the Report itself is a condensed document occupying only some 26 pages and is therefore impossible to abstract, a few of the more important conclusions must suffice.

Under Epidemiology the "open" and "closed" cases are defined and proof is given of the higher infectivity of the lepromatous case.

The importance of control is stressed; a proportionately long time was given to its consideration, and the findings occupy 7 pages of the Report. The failure of compulsory segregation is explained, and it is shown that if control is to be achieved there must be early diagnosis and treatment before the patient has had time to spread infection to those with whom he is in contact. This is best accomplished by following up known cases to their homes and examining family members and neighbours, care being taken, however, first to win the confidence of those to be examined.

The Committee strongly recommends that trials should be made of the value of BCG as a preventive, particularly given by mouth, with suitable controls and with statistical evaluation.

A Mass Campaign is recommended in an area as closely comparable as possible to one in which a concentrated attack on leprosy is already being staged. The mass campaign would consist of (1) sulphone treatment of all known cases, efforts being made to detect the unknown and to find concealed cases by doing away with compulsory segregation; (2) BCG vaccination of the whole non-leprous population, or at least of contacts; (3) improvement of general health through improved diet and through treatment of common infectious and parasitic diseases.

For treatment, preference is given to DDS orally administered in one of the following three régimes: 100 to 200 mgm. daily; 200 to 400 mgm. twice weekly; or 300 to 600 mgm. once weekly. Thiosemicarbazone, while considered unsuitable for mass treatment, is useful as an alternative treatment for patients who cannot tolerate sulphones or who do not respond adequately to sulphone treatment. Instillation of cortisone drops into the eye, or subconjunctival injections, have been found of value in leprous eye inflammation, as has also its injection into nerves in cases of severe neuritis.

Further research is recommended on the effects of physiotherapy, restorative surgery and orthopaedics.

One of the most useful accomplishments of the conference was its findings on classification, which prepared the way for the agreement 11 months later at the International Congress in Madrid. Four forms of leprosy are recognized in the primary classification: lepromatous, tuberculoid, indeterminate and borderline.

Under immunology, certain standards were formulated regarding the preparation of lepromin antigen, reading of reactions to lepromin, etc.

Lastly, in order to assess the value of histopathological examinations, it was agreed that a limited number of histopathologists working on leprosy should report their findings on a number of identical specimens taken from various types of cases. The specimens would be distributed through WHO, and records relating to the specimens would be kept confidential for the later use of the evaluating authority. As specimens would be identified only by numbers, the examiners would have no records to help them in making their evaluations.

All those interested in leprosy should have a copy of this Report which gives in clear and concise language a useful précis of the present knowledge

of leprosy, and suggests important subjects for future research and paths along which advance may be made in the knowledge and control of this disease. *Ernest Muir*

Sagher, F. **Leprosy.** (A Review of the Literature of late 1950, 1951 and part of 1952.) Reprinted from *Dermatologica.* 1953, v. 107, No. 3, 182–224. [449 refs.]

American Geographical Soc. **World Distribution of Leprosy 1952.** *Atlas of Diseases.* Plate 7 (1 coloured map on folding pl.). [Numerous refs.] 1953.

On the one side of a 38 × 25 inch sheet is an elliptical equal-area projection map of the world, while on the back of the sheet there are given in alphabetical order the affected countries with the places of leprosaria in each. A list of foci in various countries is also given, which are also marked "F" on the map. The basic sources of information are listed, and a selected bibliography under countries is added. The map has three colours: blue, violet and red, each in three shades. These indicate the rates per 1,000 inhabitants from less than 0·31 up to 60·01 and over. Under this last category appear Burma and some parts to the west of Uganda. In the top corners of the map is a list of the known and estimated numbers of cases given alphabetically under countries. [While the statistics are necessarily only very approximate, this Atlas is of considerable value as giving at a glance an idea of the world distribution of leprosy.] *Ernest Muir*

Markianos, G. [**Foci of Leprosy in Greece**] *Arch. Hyg. Athens.* 1953, Jan.–Mar., v. 3, Nos. 1/3, 37–40. [In Greek.] English summary 108.

The English summary appended to the paper is as follows:—

"The writer on the basis of his observations as Director of the Leprosy Station of Athens on 1314 cases, determines the areas in Greece which constitute the main foci of the disease. Among those areas the Attica region and the Aegean islands show the greater number of cases."

Sloman, J. G. **Hansen's Disease in New Guinea.** *Med. J. Australia.* 1953, Sept. 26, v. 2, No. 13, 487–8.

This paper consists largely of a brief account of the classification, diagnosis and treatment of leprosy. It is stated that in New Guinea the tuberculoid type predominates.

The only new point of special interest is the statement that while Hansen's disease is not a public health problem among the white people of Australia at present, it has become more prevalent among the black Australians, a recent survey showing 56 cases per 1,000 in the Northern Territory.

Numa, J. **The Prevalence of Leprosy in the Cook Islands.** *Internat. J. Leprosy.* New Orleans. 1953, Apr.–June, v. 21, No. 2, 151–60, 1 fig.

The Cook Islands are divided into a northern and a southern group, the former being chiefly coral atolls with poor soil, and the latter chiefly volcanic with good soil. Leprosy is said to have been introduced first from Hawaii to Penrhyn, the most northerly island, in 1860, and from there it spread through the northern group, but only reached the southern group at the beginning of this century. In 1926, after a survey had been made, it was arranged to send all leprosy patients in the Cook Islands to Makogai in the Fiji Islands for isolation and treatment. Since then up to 1951, 238

patients were admitted. In the northern islands 68 cases were diagnosed from 1926 to 1930, and only 11 from 1946 to 1950, showing that the disease is coming under control. In the southern group there were 9 and 16 respectively in these two periods, 11 in 1951 alone. The apparent spread in the south is causing some anxiety. *Ernest Muir*

DE MONTAIGNE, E. L. **Leprosy in Jamaica.** *West Indian Med. J.* 1953, June, v. 2, No. 2, 125–33.

Under a description of the early signs of leprosy in Jamaica the author writes: "Ocular involvement often may be the first indication of leprosy. Acute ocular invasion may precede dermatological manifestations in many cases. . . . Lesions of the fundus can be seen as distinct 'pearls', which may appear and disappear. . . . These pearl-like lesions of the fundus and the vascular changes in the capillary network of the limbus are both early signs of leprosy. . . ." [Though it may be true that such ocular manifestations sometimes precede obvious clinical lesions of the skin, it is the experience of most leprologists that the surrounding skin becomes definitely bacteriologically positive prior to lesions of the eyes.]

Interesting accounts are given of the results of the introduction of sulphone treatment to the leprosy hospital. "In the seven years immediately prior to the adoption of sulphone therapy, seventy-one patients were discharged from the hospital of whom only five were suffering from lepromatous lesions. In 1948 it was decided to discharge the majority of those having only tuberculoid lesions, all of whom now receive domiciliary treatment. . . . Of the 28 discharged in 1948, only one had had the lepromatous type of disease. In the four years since sulphone therapy has been established and has become effective, 109 patients have been discharged—some four times the usual rate, and of these, 64 were originally of the lepromatous type. In 1952 alone, 42 of the 49 patients discharged from hospital had suffered from this form of lesion." *Ernest Muir*

FERNANDEZ, J. M. M. **The Pan-American Classification of the Forms of Leprosy.** *Internat. J. Leprosy.* New Orleans. 1953, Apr.–June, v. 21, No. 2, 133–49, 2 figs.

The classification agreed on at the third Pan-American Conference is based on clinical, histological, immunological and bacteriological findings for distinguishing the principal forms. Subclassification is determined by the position of the lesions, their morphology and the extent of the clinical manifestations. The indeterminate form is often hard to recognize without histological examination, which is difficult to accomplish in rural places where a laboratory is not available. This being so, it is best in such places to consider every case as indeterminate if it cannot be confidently classed as lepromatous or tuberculoid from clinical signs. Polyneuritic cases are subclassed under the principal groups. Borderline cases are considered as reactional episodes and are divided according to their original form into lepromatous, tuberculoid or indeterminate. *Ernest Muir*

DHARMENDRA & CHATTERJI, S. N. **A Proposed System of Classification of Leprosy.** *Leprosy in India.* 1953, Oct., v. 25, No. 4, 242–56.

The Classification suggested here is very similar to that suggested by WADE [this *Bulletin*, 1953, v. 50, 945] but it groups Tuberculoid, Maculo-anaesthetic and Polyneuritic under "Nonlepromatous", Borderline and

Indeterminate under "Intermediate", leaving Lepromatous in a group by itself. It is in conformity with the views expressed by various workers in India during recent years. [Since this paper was published the International Congress of Leprologists was held in Madrid. The classification there adopted is generally in conformity with that described in this paper, and in the opinion of the majority of those present at the Congress is in some respects simpler and more workable.] *Ernest Muir*

Montestruc, E. A propos de la classification de la lèpre de R. Chaussinand. (La réaction d'hémagglutination dans les différentes formes de la lèpre.) [**Observations on Chaussinand's Classification of Leprosy. The Haemagglutination Reaction in the Different Forms of Leprosy**] *Arch. Inst. Pasteur de la Martinique.* 1953, July–Oct., v. 6, Nos. 3/4, 31–6.

The author, while agreeing with the classification of leprosy put forward by Chaussinand [this *Bulletin*, 1953, v. 50, 818, 1143], considers that the haemagglutination reaction of Middlebrook and Dubos should be used in classifying cases along with the other criteria: clinical, bacteriological, immunological and histological. Tables are given showing the haemaggluination and haemolytic titres in lepromatous, tuberculoid and indeterminate cases, the titres being highest in lepromatous and lowest in indeterminates, and diminishing steadily as patients improve under treatment. *Ernest Muir*

Furniss, A. L. **The Lymph Glands in Leprosy.** *Indian J. Med. Sci.* 1953, Sept., v. 7, No. 9, 475–81, 10 figs. on 2 pls. [30 refs.]

The pathology, both macroscopic and microscopic, of 60 lymph glands from lepromatous and neural leprosy is described and the findings of former workers are confirmed. In only 2 tuberculoid cases were lesions found in the lymph glands, and in both of these inoculation of guineapigs showed the presence of tuberculosis. Gland suppuration is probably the result of concurrent tuberculosis. Gland puncture for the diagnosis of early leprosy is not recommended, as the bacilli can be found earlier either by routine methods in the skin, or by one of the recent concentration methods. It is suggested, however, that the lymph glands may act as a reservoir for residual bacilli in cases found otherwise negative, and thus lead to relapse of the disease. The microscopic appearances are well illustrated with photomicrographs. *Ernest Muir*

Barnetson, J. **Osseous Changes in Neural Leprosy.** *South African Med. J.* 1953, Sept. 19, v. 27, No. 38, 827–8.

An attempt is made to account for the bone changes found in neural leprosy. Three essential features are found which have a significant degree of agreement with each other: the degree of peripheral nerve damage as evidenced by the extent of anaesthesia, failure of reflex vasomotor responses, and bone atrophy. No evidence of occlusion of large and medium-size arteries in the region of the wrist was found in the 57 cases studied, and response to local warming and cooling in 34 cases showed no significant differences from normal controls, nor was dilatability of peripheral vessels to local stimulation impaired. There was, however, distinct failure of reflex vasodilatation in the limbs, and this failure corresponded to the degree of

neurotrophic bone change and peripheral anaesthesia. (Reflex vasodilatation is tested by immersing a limb in hot water (110–115°F.) when reflex vasodilatation with rise of skin temperature will normally occur in the non-immersed limbs in 7 to 20 minutes.) The author suggests that this failure of reflex vasomotor response, which is due to destruction of vasomotor fibres by the leprous peripheral neuritis, is of fundamental importance in the causation of the osseous changes. *Ernest Muir*

Ishihara, S. **A Study of the Serum Proteins in Leprosy.** *Internat. J. Leprosy.* New Orleans. 1953, Apr.–June, v. 21, No. 2, 187–99, 3 figs.

It was found that the concentration of serum proteins was normal in leprosy except in far advanced lepromatous cases and during a period of erythema nodosum leprae (lepra reaction). In these conditions the whole serum protein was increased, but the albumin was diminished and the gamma globulin increased. The increase of gamma globulin has an important part in accelerating blood sedimentation in leprosy, and in causing a positive Takata reaction. *Ernest Muir*

Melamed, A. J. & Fiol, H. Vacunación antivariólica y reacción leprosa. [**Vaccination against Smallpox and Lepra Reaction**] *Rev. Argentina Leprologia.* Buenos Aires. 1952, Jan.–June, v. 1, No. 1, 10–12.

Of 143 persons with leprosy who were vaccinated, 109 had disease of the lepromatous type, 23 tuberculoid and 11 indeterminate. There was post-vaccination lepra reaction in 12, all with the lepromatous type. The authors conclude that the reaction is connected with the disease caused by the vaccination and is independent of any phenomena of allergy or immunity which the vaccination may provoke. There is no risk in vaccinating patients with tuberculoid or indeterminate forms, though in lepromatous leprosy vaccination may set up reactions, but these will easily yield to routine treatment. *Ernest Muir*

de Mesquita, S. J. B. & Collier, W. A. **The Histoplasmin Reaction in Leprosy Patients.** *Internat. J. Leprosy.* New Orleans. 1953, Apr.–June, v. 21, No. 2, 179–85.

In an earlier paper on the results of the histoplasmin test in Surinam, Collier and de la Fuente [*Bulletin of Hygiene*, 1953, v. 28, 1053] reported a reactor rate of 760 [44 per cent.] in a group of 1,704 people; chiefly patients in medical and mental hospitals. The present report deals with the application of the test to patients with leprosy; a disease not uncommon in the country. The tests were made with histoplasmin (Eli Lilly) diluted to 1: 1,000.

Of 675 leprosy patients tested in 3 leprosaria, 160 (23·7 per cent.) were histoplasmin positive, 106 (15·7 per cent.) were doubtful reactors and 409 (60·6 per cent.) were non-reactors. The corresponding results from tests on 932 non-leprous patients were, 423 (45·4 per cent.) positive, 172 (18·4 per cent.) doubtful and 337 (36·2 per cent.) negative. Although the leprosaria were situated in different parts of the country, the results obtained were very similar at all 3.

An analysis of the groups of histoplasmin-positive leprosy patients failed to reveal any influence, on the reactor rate, of race or sex, but adults showed a higher rate than children. In the non-leprous group, the rate was higher in males of all ages than in females. In relation to the clinical type of leprosy, the histoplasmin reactor rate showed a slight but definite increase with the grade of lepromatous leprosy (L_1, L_2 and L_3), and in L_3 it was approximately equal to that in tuberculoid leprosy.

In seeking an explanation of the consistently lower sensitivity rate to histoplasmin in leprous as compared with non-leprous patients, the authors have been led to the assumption that a form of antagonism exists between Hansen's bacillus and *Histoplasma capsulatum*, which affords the leprous patient a slight degree of protection against histoplasmosis. *J. T. Duncan*

Arnold, H. L., Jr. **The Pilomotor Response to Intradermally Injected Nicotine: an Aid in excluding the Diagnosis of Leprosy.** *Internat. J. Leprosy.* New Orleans. 1953, Apr.–June, v. 21, No. 2, 169–72, 2 figs. on pl.

In most normal skins the injection of 1 : 100,000 aqueous solution of nicotine picrate produces "gooseflesh" and sweating in a considerable area round the point of injection. In hypopigmented macules due to leprosy, however, this does not occur. This test can therefore be used to make a differential diagnosis in doubtful cases. The injection should be made at the margin of the suspected area, so that the effect in the area and that outside can be compared. *Ernest Muir*

Sagher, F. & Brand, N. **Comparison of Diaminodiphenylsulfone and Thiosemicarbazone in the Treatment of Lepromatous Leprosy. Clinical and Bacteriological Evaluation in Sixty Hospitalized Patients.** *Internat. J. Leprosy.* New Orleans. 1953, Apr.–June, v. 21, No. 2, 161–7. [15 refs.]

At the Jerusalem leprosy hospital, of 60 patients 27 received DDS, 21 thiosemicarbazone, and 12 received first DDS and later thiosemicarbazone. The thiosemicarbazone proved to be as effective as, or even superior to DDS. Of those who got thiosemicarbazone after DDS had ceased to cause improvement, 10 out of 11 with active lesions further improved clinically, and 4 bacteriologically. *Ernest Muir*

Dharmendra & Chatterji, S. N. **Treatment of Leprosy with "Sulfadione" Brand of DDS.** *Leprosy in India.* 1953, Oct., v. 25, No. 4, 257–8.

The authors had found that in most cases there was a slight reduction in erythrocytes and haemoglobin during the first 6 to 12 weeks of sulphone treatment. They had found that the administration of yeast, with or without iron, made no difference to this occurrence [this *Bulletin*, 1953, v. 50, 1145]. The present experiment was planned to see whether the initiation of treatment with very minute doses, 10 mgm. per day instead of the usual 50 mgm., would prevent this temporary blood change. After trials in 14 non-lepromatous cases it was found that the fall in erythrocytes and haemoglobin was of at least the same order with the smaller initial dose (10 rising to 100 mgm. over 3 months) as with the larger dosage (50 rising to 100 mgm). "Sulfadione" is a DDS preparation containing

10 mgm. in each tablet. These small tablets are useful, especially for small children and for those who are intolerant to the usual doses.

Ernest Muir

Tzanck, A., Basset & Salomon. Résultats d'une nouvelle sulfone dans le traitement de la lèpre. [**Results Obtained with a New Sulphone in the Treatment of Leprosy**] *Bull. et. Mém. Soc. Méd. Hôpit. de Paris.* 1953, Nos. 21, 22 & 23, 715–18.

The history is recorded of treatment of 3 cases with a new sulphone called " Di-Atox argentique ", but no description of the chemical formula is given. Two to four 50-mgm. tablets are administered daily. It is claimed that there is remarkable tolerance for this drug when administered over a number of years, and that its effectiveness does not diminish over long periods. [No mention is made of the blood concentration, the degree of absorption or the rate of excretion, and no evidence is given that this drug differs from DDS in the two qualities mentioned.] It is suggested that it might be of value in combination with other drugs in the treatment of tuberculosis.

Ernest Muir

Garduño, D. M. **Dihydrostreptomycin in Leprosy Cases in the Armed Forces of the Philippines.** A Preliminary Report. *J. Philippine Med. Ass.* 1953, Sept., v. 29, No. 9, 451–62, 7 figs.

Thirty-six patients were divided into 3 groups. Group I was treated with dihydrostreptomycin alone. Of the 6 lepromatous cases 5 became bacteriologically negative with complete regression of skin symptoms (CRS) in about 14 months. Of 13 tuberculoid cases 11 became CRS in 7·8 months.

Of Group II, on dihydrostreptomycin with Promin, 3 out of 6 became CRS and bacteriologically negative. In Group III, on dihydrostreptomycin and PAS, 2 out of 9 lepromatous patients became negative after 11 months and 6 months, the former also becoming CRS. The conclusion is that " further experimentation on the leprotic (*sic*) action of dihydrostreptomycin —either alone or as an adjunct to the sulfones, PAS, or isoniazid—should be carried out to confirm or disprove the encouraging results obtained in this study ".

Ernest Muir

Latapi, F., Ribio, J. B., Rodriguez, O. & Estrada, S. C. **Report on 9 Months Treatment of Leprosy with Isoniazid (Nydrazid).** *J. Investigative Dermat.* 1953, July, v. 21, 27. [Summary taken from *J. Amer. Med. Ass.* 1953, Oct. 31, v. 153, No. 9, 883.]

Latapi and co-workers treated 14 patients with leprosy ranging in age from 14 to 62 years. Tablets of isoniazid (Nydrazid) were given in doses that varied between 3 and 5 mgm. per kilogram of body weight per day. No other therapy was used except when it was necessary to treat intercurrent disease, for which penicillin was given parenterally or other drugs were given that have been proved not to have any effect in leprosy. Thirteen of the 14 patients had the lepromatous type (one diffuse and 12 nodular) of the disease, and one patient had tuberculoid leprosy. Clinical and histopathological changes indicated that isoniazid was therapeutically active in the lepromatous type of leprosy. Benign or moderate lepra reactions occurred in about half of the patients with the lepromatous type treated. The results obtained justify continuation of this study. The drug was well tolerated, and no toxic manifestations could be detected.

Lima, S. de O. & Magarão, M. F. Tratamento da tuberculose pulmonar em doente de Hansen. [**The Treatment of Tuberculosis in the Leprosy Patient**] *Rev. Brasileira Tuberculose.* Rio de Janeiro. 1953, May–June, v. 21, No. 147, 397–408. [25 refs.]

First, great stress is laid on the importance of early diagnosis and treatment. In 67 patients with cavities there were only 2 cures (3 per cent.), while in 52 without cavities there were 80 per cent. In addition to a regimen of hygiene and diet streptomycin is found useful in clearing up both diseases. Even in streptomycin-resistant cases this drug should be persisted with, as favourable general results can still be obtained. Isoniazid was also tried in 22 patients, with beneficial results in 21. This drug was found also to have a good effect on the leprosy lesions, especially those of the mucous membranes. *Ernest Muir*

Melamed, A. J. & Jonquieres, E. D. L. Tuberculosis en enfermos afectados de lepra. Acción de las sulfonas. [**Tuberculosis in Leprosy Patients; the Action of Sulphones**] *Rev. Argentina Leprologia.* Buenos Aires. 1952, Jan.–June, v. 1, No. 1, 14–21, 15 figs. [19 refs.] French summary.

Nineteen leprosy patients with associated tuberculosis were observed. It is suspected that sulphone treatment activated the tuberculosis, and in the cases observed sulphone failed to prevent or remedy it. There is evidently an absence in lepromatous cases of acquired immunity due to tuberculosis such as may possibly be seen in indeterminate cases with a negative Mitsuda reaction. Mention is made of the improved prognosis, when these two diseases are combined, by the use of streptomycin, PAS, thiosemicarbazone and calciferol. Notes are given of each of the 19 cases and several skiagrams of the chest are reproduced. *Ernest Muir*

Magarão, M. F. & Lima, S. de O. Reação de prognóstico da tuberculose pulmonar em hansenosos-tuberculosos. [**A Prognostic Reaction for Pulmonary Tuberculosis in Cases of Leprosy**] *Rev. Brasileira Tuberculose.* Rio de Janeiro. 1953, Mar.–Apr., v. 21, No. 146, 295–301.

The author describes a test similar in its nature to the Mitsuda test. A suspension containing 400,000 BCG organisms is injected intradermally and the results are read after 4 to 6 weeks. The sign of a positive reaction is the formation of a nodule of 8 mm. diameter. The patients chosen were 16 suffering from leprosy alone and 44 suffering from a combination of leprosy and tuberculosis. All had previously been tested by the Von Pirquet test. Of the 32 patients with pulmonary tuberculosis and who gave a positive nodule with BCG, 29 (91 per cent.) progressed favourably. All the 12 without nodules developed unfavourably, 3 died, 4 became worse and 5 remained stationary. *Ernest Muir*

Lowe, J. & McNulty, F. **Tuberculosis and Leprosy: Immunological Studies in Healthy Persons.** *Brit. Med. J.* 1953, Sept. 12, 579–84. [33 refs.]

This paper is the same in substance as that published in *Leprosy Review* [this *Bulletin*, 1953, v. 50, 948]. There is, however, an important addendum which may be quoted in full:

"I have received from Dr. H. W. Wade, Editor of the *International Leprosy Journal*, further information about the results of B.C.G. vaccination in the prevention of leprosy in Brazil. Dr. Nelson de Souza Campos has sent to Dr. Wade a letter on this subject for publication the main facts of which are as follows:

"B.C.G. has been given orally to some 'contacts' of leprosy cases at the Central Leprosy Dispensary in São Paulo. Of nearly 1,700 such contacts given B.C.G., 10 (0·6%) developed leprous lesions, all tuberculoid (mild). Of over 3,300 similar contacts not given B.C.G. 179 (5·4%) developed leprous lesions—some lepromatous (severe), some indeterminate, and some tuberculoid. No details are yet available." *Ernest Muir*

Lowe, J. & McNulty, F. **The Effect of BCG in Lepromatous Cases of Leprosy.** *Internat. J. Leprosy.* New Orleans. 1953, Apr.–June, v. 21, No. 2, 173–7.

In 104 lepromatous cases negative to both lepromin and tuberculin the intracutaneous inoculation of BCG was given. Of these 84·6 per cent. responded positively to tuberculin after 2 months, and 11·5 per cent. became positive to lepromin after the same time. A higher number were found to have become positive later (as is mentioned in an addendum). Conversion to a positive lepromin does not appear to be dependent on the state of the patient, the treatment given or the bacterial index. In most of those who became positive the result was only temporary. It is hoped to amplify the experiment by giving repeated vaccination, and thus to find out if this influences the prognosis of the case: such vaccination would need to be oral, in order to avoid a serious Koch phenomenon. [The quantity of BCG injected intradermally is given in this paper as 0·1 gm. This is presumably a misprint for 0·1 mgm., the usual dose, and that in fact used by the authors in their previous study [this *Bulletin*, 1953, v. 50, 948]. *Ernest Muir*

Floch, H. Discussions sur les résultats obtenus en prophylaxie antilépreuse par la vaccination B.C.G. [**Discussions on the Results obtained in the Prophylaxis of Leprosy through BCG vaccination**] *Arch. Inst. Pasteur de la Guyane et du Territoire de l'Inini. Publication No. 279.* 1953, Mar., 6 pp.

The author considers that, though *Myco. tuberculosis* may give rise to a state of allergy to *Myco. leprae*, the inverse is very far from being the general rule. In testing the relationship of the 2 organisms in this respect he prepared an antigen from BCG (for use in a skin test) by the method used by Hayashi in preparing antigen for the lepromin test, and containing approximately the same number of organisms in each field of the microscope as in the Mitsuda antigen diluted to 1/750 instead of 1/30. The results obtained are as easily read as those with 1/30 lepromin. After these 2 antigens had been used in 144 patients—40 lepromatous, 58 undifferentiated and 46 tuberculoid—concordance of results was found in 98·70 per cent. The author does not agree with Rosemberg, Souza Campos and Aun [this *Bulletin*, 1950, v. 47, 1095] that the Mitsuda reaction is different in nature from the allergic tuberculous reactions. He holds that the early reaction is caused by antigenic fractions dissolved in the injected antigen, and that the late reaction is caused by antigenic fractions liberated by the destruction *in vivo* of the bodies of microbes. In the tuberculous antigen there are more of the antigenic fractions already dissolved than in the Mitsuda

antigen, and thus the early reaction is more intense. Also, the bodies of tubercle bacilli are more quickly destroyed than those of the more resistant leprosy bacilli; and thus there is no discontinuity between the early and late reactions as there is in the lepromin test. The tubercle and leprosy bacilli (but especially the former) are able to provoke cross reactions of allergy and partial immunity. The author discusses results reported by the doctors at Chapineria Preventorium in Spain in which the Mitsuda reaction had been rendered positive by BCG in only 44·44 per cent. of cases, but by other vaccines (smallpox, TAB, etc.) in 72·22 per cent. He acknowledges that possibly these other vaccines might strengthen the effect of an already positive tuberculin reaction (most of the cases were tuberculin-positive), and consequently form a more favourable condition for the Mitsuda reaction to become positive. *Ernest Muir*

HELMINTHIASIS

Jelliffe, D. B. **Notes on the Modern Treatment of Intestinal Helminths.** *West Indian Med. J.* 1953, Sept., v. 2, No. 3, 193–204. [55 refs.]

Hunter, G. C. **Nutrition and Host-Helminth Relationships.** *Nutrition Abstracts & Reviews.* 1953, Oct., v. 23, No. 4, 705–14, 4 figs. [Numerous refs.]

Flaschenträger, B. & Taha, M. M. Zur Biochemie der Bilharziasis. [**Biochemical Observations in Schistosomiasis**] *Hoppe-Seyler's Ztschr. physiol. Chem.* 1953, v. 295, 285–9, 3 figs.

This short paper deals with 3 aspects of schistosomiasis.

i. The first note deals with the isolation of the eggs of *S. haematobium*. The authors describe a technique in which the infected urine is passed through a series of rustless steel wire filters (screen-cloths). The first filter is made of wire 0·05 mm. in diameter enclosing apertures of 0·10 mm. This allows the passage of the eggs, both directly and by subsequent washing with 2 per cent. saline, but retains much unwanted sediment, such as blood clot, mucus and the larger crystals. The second filter, which retains the eggs washed through the first, is made of wire thread 0·035 mm. in diameter enclosing apertures of 0·042 mm.

ii. The second note deals with the influence of the *p*H of the water in which the eggs of *S. haematobium* are placed on their hatching and on the activity of the emerging miracidia. It was found that the optimum *p*H for both purposes was between 7·4 and 8.

iii. The third note describes an apparatus in which recently emerged miracidia are free to take up their habitat in either an acid or an alkaline medium. The results obtained with this apparatus were inconclusive.

[Those interested should consult the original paper for details of the techniques used.] *R. M. Gordon*

Lurie, H. I. **Clinical Pathological Findings in Early Bilharziasis.** *South African Med. J.* 1953, Nov. 7, v. 27, No. 45, 1011–13.

Until ova are passed human schistosomiasis is very difficult to diagnose. Eight people from Johannesburg who bathed in the Crocodile River, which

is a recognized reservoir of *Schistosoma haematobium* infection, suffered at the time from bather's itch. They were first seen 14 days later, when 2 gave a doubtful complement-deviation test with a schistosomal cercarial antigen; by the third week the test was positive in 7 of the patients; the eighth patient was examined 4 weeks after the exposure to infection and his complement-fixation test was then strongly positive. Between the 4th and 7th weeks after the exposure 6 of the patients had eosinophilia; though no ova were found, these 6 patients were treated with Nilodin (75 mgm./kgm. divided over 5 days). The complement-deviation test became negative 22–23 weeks after treatment in 2 of these cases; in a third it became doubtful by the 28th week after treatment. In the 2 patients who did not develop an eosinophilia, and so were not treated, the complement-deviation tests which had become positive by the second and third weeks reverted to negative by the thirty-first week after the exposure to infection. In all cases the cercarial antigen skin tests were negative throughout.

The authors regard the complement-fixation test as the best test for the early diagnosis of schistosomiasis, but a positive reaction does not necessarily imply an active infection. *A. R. D. Adams*

Schneider, J. **Preliminary Study of the Incidence of Intestinal Schistosomiasis amongst the Non-White Races of Natal, Union of South Africa.** *J. Trop. Med. & Hyg.* 1953, Nov., v. 56, No. 11, 251–5, 6 figs.

Urinary schistosomiasis is known to be prevalent in Natal, South Africa, especially along the coastal belt; intestinal schistosomiasis, though it occurs, is said to be uncommon. To determine the incidence of these diseases rectal biopsies were done on 261 unselected patients of African, Indian and " coloured " origin, who were patients in the tuberculosis wards of the King George V Hospital at Durban. Of 109 Africans (58 male and 51 female), ranging in age from 8 to 60 years, 35 (32·1 per cent.) yielded schistosome eggs on biopsy (24 *S. haematobium*, 11 *S. mansoni*, but none with a double infection); of 98 Indians (48 male and 50 female), of a similar range of ages, 22 (22·4 per cent.) yielded these ova (7 *S. haematobium*, 13 *S. mansoni*, and 2 a double infection); of 54 " coloured " (34 male and 20 female), ranging in age from 17 to 64 years, 11 (20·4 per cent.) yielded the eggs (5 *S. haematobium*, 6 *S. mansoni*, but none with a double infection). Therefore, of the total (261) of all races, 68 (26 per cent.) yielded schistosome eggs on rectal biopsy, of which 36 were *S. haematobium*, 30 *S. mansoni*, and 2 mixed infections. So the incidence not only of *S. haematobium* but also of *S. mansoni* infestation in the non-white population of Natal is high. It was observed that in most cases only dead eggs were found, and that this was the case even when there was no history of antecedent anti-schistosomal treatment; the author concludes that these patients had spontaneously overcome their infections.

The relevant dates are set out in 4 tables, and there are 6 good microphotographs of biopsy recoveries. *A. R. D. Adams*

Cardoso, W. A esquistossomíase mansônica no negro. [*Schistosoma mansoni* **Infection in the Negro**] *Med. Cirurg. Farmácia.* 1953, Feb.–Mar., Nos. 202/203, 89–95, 2 graphs. [18 refs.]

The author in preliminary remarks notes the different susceptibilities of Whites and Negroes to certain diseases, especially malaria, tuberculosis,

syphilis, influenza, pneumonia and pulmonary complications of the infective diseases, ascribable in part to "anti-hygienic and socio-economic conditions". On the other hand, the Negro seems to be less susceptible to, or to suffer less from, infections with which he has been long in contact, *e.g.*, ankylostomiasis. The author has now studied the question of the relative susceptibility of Whites and Negroes to infection by *Schistosoma mansoni*. To this end he has examined the records of 4,272 patients at Itaporanga d'Ajuda, in the State of Sergipe, for estimating incidence of infection, and 400 of them from the clinical aspect. Of the total 4,272, there were 2,192 Whites and 1,801 (82·1 per cent.) were positive. [What this means is not quite clear, for all were said to be "schistosomiasis patients"; perhaps the author means that these were patients sent up on suspicion of infection.] Of 2,080 Negroes 1,579 (75·9 per cent.) were positive. The clinical forms were divided into 4 types or grades: (1) asymptomatic; (2) those with intestinal symptoms and hepatomegaly; (3) those with enlarged liver and a palpable spleen; (4) those with more advanced symptoms, enlarged liver and spleen, with haematemesis or ascites and signs of collateral circulation. The Negroes showed a higher percentage of the less severe forms and a lower percentage of the more severe grades. Of the 400, there were 200 each of Whites and Negroes. Of grade I there were 26 (13·0 per cent.) of Whites (A), 68 (34 per cent.) of Negroes (B); of grade II 84 (42) of A, 90 (45) of B; of grade III 69 (34·5) and 40 (20) of A and B respectively; and of grade IV 21 (10·5) of A and only 2 (1·0) of B.

The author attributes this resistance to infection on the part of the Negro to his having a thicker skin, barring the penetration of the cercariae, to a higher *p*H of the skin and to an immuno-biological resistance acquired through years of contact with the parasite—a threefold barrier, mechanical, chemical and immuno-biological, and compares this with the relatively greater resistance to the pathogenic effects of hookworm infection. [Little support is given for the latter assumption.] *H. Harold Scott*

DE FARIA, J. Lopes. Histopatologia da endarterite pulmonar esquistossomótica (*S. mansoni*). [**Histopathology of Pulmonary Endarteritis due to Infection by** *Schistosoma mansoni*] 151 pp., 103 figs. on 15 pls. 1952. São Paulo: Emprêsa Gráfica da "Revista dos Tribunais" Ltda., Rua Conde de Sarzedas, 38.

It is unfortunate that so elaborate and carefully executed a piece of work such as is here described should interest so small a section of those engaged in tropical research. *Schistosoma mansoni* infection can at best be regarded but as a section of helminthology, and pulmonary involvement by the ova only as a subsection of this and the morbid histology as but a subsidiary though important feature of the infection. On this subject, except for 6 cases described by SHAW and GHAREEB [see this *Bulletin*, 1938, v. 35, 665] and those by JAFFÉ between 1939 and 1948 [*ibid.* 1946, v. 43, 350], only isolated cases have been recorded. The author has, therefore, studied the question afresh in the pathological department of the University of São Paulo and presented it as a doctorate thesis at the Faculty of Medicine of the University of Minas Gerais.

The author starts by a review of the literature and a sketch of the lesions described hitherto, notably endarteritis and periarteritis, with localized or diffuse fibrous thickening of the intima, narrowing or even occluding the lumen, and proliferation of the connective tissue of the adventitia. This

may, or may not, be accompanied by schistosomal granulomata. It must be constantly borne in mind that lesions are rarely confined to one organ, a fact which, he thinks, points to some toxic basis [but this does not necessarily follow, as the author himself agrees later]. According to Jaffé the endarteritis and periarteritis, with more or less intense lymphocytic infiltration, produce lesions like those of periarteritis nodosa. Others describe an associated or consequent condition of cor pulmonale.

As regards material and technique, among 113 necropsies with schistosomal lesions there were 8 with typical chronic schistosomal cor pulmonale; 7 of these were women. These patients had shown the symptoms and signs of right-sided heart failure and, post mortem, hypertrophy and dilatation of the right ventricle and cirrhosis of the liver due to the parasite. Two others had similar hypertrophy and dilatation of the left ventricle also. In addition to the 8 referred to, the author examined the lungs of 5 patients with schistosomal hepatic cirrhosis and oesophageal varices, as what he calls controls. The tissues were fixed in 10 per cent. formol, and paraffin and frozen sections stained in various ways were prepared for examination.

The results of these examinations and a discussion of them follow. Two groups are dealt with: those with cor pulmonale, hypertrophy and dilatation of the right ventricle, 8 in number, and 5 others without these signs and symptoms. Among the former, granulomata were present in 5, numerous in 1, few in 4; cicatrices of old granulomata were very many in 1, many in another, few in 4, not seen in 2; calcified ova were common in 1, few in 6, absent from 1; focal destruction of the arterial walls was frequent in 1, present but rare in the other 7; the same was observed as regards diffuse necrosis; hyaline thrombi numerous in 1, few in 5, absent from 2; serous endarteritis in all but one; " fibrinoid degeneration " of the intima in 5, with haemorrhagic infiltration. This endarteritis results in fibrous thickening with marked narrowing of the lumen and rise in pulmonary tension. Throughout, it is the smaller arteries which are affected and the condition is caused by the ova themselves.

Of the 5, where cor pulmonale was not present, 2 showed schistosomal granulomata or their scars; 2 others had older cicatrices and one was in " an intermediate stage ". This section deals with the question in quite general terms; full details are given later in the work and occupy 85 pages of letterpress. There is a brief discussion of the results in which the author deals successively with the part played by the ova in bringing about obstruction of the arteries and consequent pulmonary hypertension, and the rôle of endarteritis in causing the increased tension, the pathogenesis of the endarteritis, the significance of the " fibrinoid degeneration " and the hyaline thrombi; and, lastly, arterio-venous anastomoses and pseudo-aneurysms from a necrotizing arteriolitis, with hyaline deposits in these necrotic areas. As stated above, 85 pages are taken up with a most minute description of the morbid anatomy and histology of the organs and tissues of each of the 13 subjects and finally excellent reproductions of photographs of the tissue changes. It is, perhaps, a pity that with such an abundance of photomicrographs, many of which represent almost identical lesions, room was not found for coloured reproduction of a few of them, for the differential staining would have demonstrated the more important and striking of these changes more clearly than the best photographs.

The whole thesis is well documented; 129 references are given in a bibliography, many of them American and German, but British contributors are also represented. *H. Harold Scott*

Pessôa, S. B. Sôbre dois antimoniais penta-valentes no tratamento da esquistossomose mansônica (Glucantime e Solustibosan). [**Two Pentavalent Antimonials in the Treatment of** *S. mansoni* **Infection (Glucantime and Solustibosan)**] *Brasil-Médico.* 1953, Mar. 21 & 28, v. 67, Nos. 12/13, 211–15.

The English summary appended to the paper is as follows:—

"In the treatment of Manson's schistosomiasis the author used Glucantime Rhodia (antimonic N-methyglucamine) and Solustibosan Bayer (gluconate of sodium and antimony). Both pentavalent antimonial agents proved ineffective in this kind of helminthiasis. If we consider an increased sedimentation rate following treatment with antimony as a significant symptom, both preparations apparently have some toxic influence on the liver of patients suffering from schistosomiasis."

Pitchford, R. J. **Some Observations on Aquatic Snails in relation to Centrifugal and Hydraulic Ram Pumps.** *Pub. Health.* Johannesburg. 1953, Mar., v. 17, No. 3, 325–7.

Snails are known to survive after passing through centrifugal pumps. In order to test whether the raised pressures developed in such pumps were lethal to very young snails, specimens of *Planorbis*, *Physopsis* and *Lymnaea*, aged from one day to one week, were subjected to pressures of 95 to 150 lb. per square inch for 10 to 15 minutes. All snails were alive 48 hours later. A pressure of 150 lb. per square inch is equivalent to a head of 346 feet in a centrifugal pump. Ova similarly survived pressures of 100 to 125 lb. per square inch. Ram pumps, on the other hand, do not in practice let snails through. This was investigated by putting snails into the inlet pipe of an hydraulic ram, the outlet being screened with a cloth bag. None was recovered at the outlet but many, alive or crushed by the valves, were discharged at the waste valve. If the snails were put directly in the air chamber of the ram most of them were recovered alive at the outlet pipe. Snails survived in galvanized iron piping for 12 hours but a proportion died during the following 36 hours. Dams fed by centrifugal pumps from a snail infested source readily become infested, but those fed by hydraulic rams remain free from snails. *T. H. Davey*

Cruz, O., Jr. & Dias, E. *Bacillus pinottii* **sp. n.** [Correspondence.] *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 581–2, 1 fig.

The authors, from the Instituto Oswaldo Cruz, Rio de Janeiro, describe an apparently new species of *Bacillus*, isolated from *Australorbis glabratus*, in Bambui, Minas Gerais, which has been found to be lethal to several species of mollusc. It has been tried on intermediate hosts of *S. mansoni* in Brazil, with good results, and is now being tried in Egypt.

The bacillus, which is shown in a photomicrograph, is a motile rod with peritrichous flagella and measures 0·2 to 0·7 μ by 1·0 to 3·0 μ. The spores are pleomorphic and terminal. The Gram-staining is variable.

The bacillus grows well on broth and agar and its *p*H requirements are given. It does not coagulate milk, nor ferment any carbohydrates. Gelatin is liquefied rapidly and haemolysis occurs on blood agar. Indol is produced, but H_2S is not. The methyl-red, Voges-Proskauer, citrate, nitrate and starch tests are all negative.

The bacillus is a facultative anaerobe, with an optimum temperature of 25° to 37°C. No growth occurs at 50°C.

While the bacillus is pathogenic for some species of molluscs, it produced no local or general reactions in guineapigs and dogs, by injection, ingestion or rubbing on the skin.

The name *Bacillus pinottii* is proposed in honour of Dr. Mario Pinotti, Director of the National Malaria Service in Brazil.

H. J. O'D. Burke-Gaffney

Standen, O. D. **The Penetration of the Cercariae of** *Schistosoma mansoni* **into the Skin and Lymphatics of the Mouse.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, July, v. 47, No. 4, 292–8, 6 pls. [17 refs.]

Two mice were used and the infecting strain of *S. mansoni* was an Egyptian strain passed through *Australorbis glabratus* and mice or hamsters for nearly 4 years. The bellies of the mice were carefully shaved so that no abrasions occurred, but the author states that inevitably some of the stratum corneum must have been removed. A heavy suspension of newly shed cercariae was pipetted on to the bellies of the mice, so that it formed a globular pool with well defined margins; this suspension was withdrawn after 7–8 minutes from one mouse, which was then killed and immersed in Bouin's solution. In the second mouse a longer period was allowed for penetration, and in order to obtain cercariae at all stages, the suspension was withdrawn every 5 minutes, and replaced by a fresh suspension; the mouse was killed at the end of 20 minutes.

The author describes his findings (illustrated by beautiful photomicrographs) in detail, and discusses them. He notes that in his animals penetration occurred much more quickly than in the experiments of Gordon and Griffiths [this *Bulletin*, 1952, v. 49, 1055], and this may have been due partly to the heavy suspension he used, with consequent mass outpouring of enzyme (as suggested in a personal communication by Gordon), and partly to the method of shaving, though this should not be overstressed.

The author's summary is as follows:—

"(1) A series of 24 photomicrographs is presented which illustrate the mode of penetration of the cercariae of *Schistosoma mansoni* into the skin and lymphatics of the experimetally infected white mouse.

"(2) Penetration is effected by a combination of lytic and mechanical means with a maximum of lytic effect against those tissues which offer greatest resistance to mechanical penetration.

"(3) The cercariae penetrate between the hair follicles but may be seen to enter the bases of the latter when they lie in the path of vertically migrating larvae.

"(4) The tail may be carried down into the hypodermal tissues before detachment.

"(5) The deep fascia sheathing the muscle of the body-wall resists vertical penetration by cercariae and causes the latter to turn to horizontal wandering in the hypodermal connective tissue.

"(6) Upon reaching a lymphatic vessel the cercariae enter it and so gain entry to the venous circulatory system." *Charles Wilcocks*

Griffiths, R. B. **Further Observations on the Penetration of Mammalian Skin by the Cercariae of** *Schistosoma mansoni*, **with special reference to the Effects of Mass Invasion.** *Ann. Trop. Med. & Parasit.* 1953, Mar., v. 47, No. 1, 86–94, 8 figs. on 2 pls.

This paper is concerned with the differences in the behaviour and effects of the cercariae of *S. mansoni* during skin penetration as recorded by Gordon

and Griffiths [this *Bulletin*, 1952, v. 49, 1055] and by Standen (*Trans. Roy. Soc. Trop. Med. & Hyg.*, 1952, v. 46, 384). According to the latter author there was a profound effect on the stratum corneum and a comparatively rapid rate of penetration, neither of which was observed in the work of the former authors. The difference between the two sets of observations might have been due to the different concentrations of cercariae used in the experiments, so the earlier work of Gordon and Griffiths was repeated. Massive doses of cercariae were used with the following results: (1) After 20–25 minutes of exposure the separation of the cornified layers of the skin is considerable but their continuity with the adjacent skin is unaffected and there is no " rolling back " of the stratum corneum as observed by Standen. (2) Evidence was obtained that the speed of migration to the deeper tissues is increased as a result of massive invasion, for after 20–25 minutes of exposure, numbers of cercariae were found below the dermis, in the fat layer and in the subcutaneous connective tissues overlying the abdominal musculature, and it is suggested that penetration of the dermis is facilitated by the concentrated effects of large numbers of cercariae. (3) It was observed that although most of the cercariae after entering the skin had discharged their glandular secretions (as previously described after moderate exposure) some of the cercariae had only incompletely emptied anterior cephalic glands. It is thought that this may be due to the fact that in massive invasion such cercariae have found an easier method of entry, *via* punctures made in the stratum corneum by other cercariae, and have not utilized completely the glandular material which is normally necessary for penetration. *J. J. C. Buckley*

Stirewalt, M. A. **The Influence of Previous Infection of Mice with *Schistosoma mansoni* on a Challenging Infection with the Homologous Parasite.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 867–82, 12 figs. [10 refs.]

It was the purpose of this investigation to ascertain whether fewer parasites would become established from a second exposure in mice previously infected with *Schistosoma mansoni* than from an accompanying control infection of previously uninfected mice. The author's summary and conclusions are as follows:—

" Female albino mice were re-exposed to cercariae of *Schistosoma mansoni* at intervals of one hour, five hours, one day, two days, one week, one month and two months after an original exposure, together with previously unexposed control mice. Exposures were to 50 cercariae per mouse by tail for one hour. For all except the longest interexposure interval the parasites of the initial and challenging infections were tagged by their sex, and the mice were initially exposed at the age of about six weeks. When the interval between exposures was two months, each exposure was to both male and female cercariae, and the initial infection was presented to the mice when they were one week old. In all studies autopsies were performed six weeks after the second exposure.

" The following conclusions have been drawn:—

" 1. The percentage of schistosomes maturing from the challenging exposure in the superinfected mice was significantly reduced below that in the control mice when the interexposure interval was one hour, five hours, one day and two months.

" 2. On the other hand, the number of adult schistosomes maturing in the superinfected mice from challenging exposures presented two days, one

week and one month after the initial exposure was essentially equal to that from specific control exposures.

"3. This reduction was the result of a local inhibition of penetration by the cercariae of the challenging exposure when the second exposure followed the first by an interval of one hour, five hours and one day. Each exposure was to cercariae of one sex only.

"4. When the interexposure period was longer than one day, no significant inhibition of penetration was noted. No clue was found to the mechanism of reduction of the worm burden from the challenging exposure when it was presented two months after the original exposure."

[It is clear to anyone reading this paper in its entirety that the observations recorded in the above summary are founded on the results of carefully designed and controlled experiments carried out with meticulous care and involving the use of adequate numbers of mice. The paper, which does not lend itself to further summarization, is an important one and should be read in the original by those interested.] *R. M. Gordon*

Meleney, H. E., Sandground, J. H., Moore, D. V., Most, H. & Carney, B. H. **The Histopathology of Experimental Schistosomiasis. II. Bisexual Infections with** *S. mansoni*, *S. japonicum*, **and** *S. haematobium*. *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 883–913, 24 figs. on 6 pls. [18 refs.]

In a previous paper [this *Bulletin*, 1952, v. 49, 880] the authors described the hepatic lesions found in mice harbouring unisexual or early bisexual infections with *Schistosoma mansoni* and compared these lesions with those found in mice infected with *S. japonicum* and *S. haematobium*. In this earlier paper lesions other than those in the liver were not considered but in the present paper a brief account is given of the lesions associated with the presence of each of these species not only as observed in the liver, but also in the intestine, the bladder, the lungs and the spleen of mice, hamsters, rats, guineapigs and rabbits. This emphasis on liver lesions caused by *S. mansoni* infections was due to the fact that more material was available from this source than from the *S. japonicum* or *S. haematobium* infections, and that the authors considered the liver provided the best tissue in which to observe the development of lesions due to eggs.

The *S. mansoni* liver material studied was obtained from 31 mice (exposed 5–32 weeks previously to 50–200 cercariae per mouse), 19 hamsters (exposed 5½–16 weeks previously to 100–500 cercariae), 19 rats (exposed 6–19 weeks previously to 100–15,000 cercariae), 6 guineapigs (exposed 6½–12 weeks previously to 2,000–4,600 cercariae) and 9 rabbits (exposed 7–16 weeks previously to 5,000 cercariae). In mice and hamsters the principal lesions are produced by fertile eggs, which cause acute or subacute tissue reactions leading to fibrosis and obstruction of the portal venules. The pathology of such lesions is progressive because the worms survive, mainly in the mesenteric veins, where they continue to deposit fertile eggs. Cellular reactions to living worms are inconstant and decrease with the duration of the infection, while diffuse cirrhosis, independent of egg lesions, does not occur. In rats, guineapigs and rabbits the worms develop more slowly, are smaller, and most of their eggs fail to develop miracidia, these undeveloped eggs acting as innocuous foreign bodies which elicit very little cellular response. The adult worms die much earlier than in mice and hamsters and produce larger localized lesions in and about the terminal portal circulation, which in the rat (but not in the guineapig or rabbit)

are often surrounded by extensive proliferation of interlobular fibrous tissue. Hematin pigment is present in histiocytes and Kupffer cells in proportion to the number, size and digestive activity of the worms and the duration of the infection. The pigment does not seem to contribute to the development of fibrosis, although it may be present in large masses in late infections associated with fibrosed egg lesions.

The *S. japonicum* liver material was obtained from 9 mice (exposed 4–25 weeks previously to 25–150 cercariae per mouse), 6 hamsters (exposed 4–24 weeks previously to 325–375 cercariae), 5 rats (exposed 4–10 weeks previously to 720–1,000 cercariae) and 12 rabbits (exposed 8–10 weeks previously to 500–2,000 cercariae). The histopathology of the resultant lesions suggests that the individual eggs of *S. japonicum* are more toxic to the tissues of the host than are those of *S. mansoni*. Not only is the cellular reaction more acute but the eggs tend to stain more intensely with eosin, indicating a more acid reaction, and there is often a flame-like, red-staining material extending outwards from the egg shell. Mice and hamsters show the most marked reaction; in rats the lesions are similar to those seen in mice and hamsters but they are smaller and areas of coagulative necrosis are absent. The infected rabbits were for the most part kept for egg production and such animals usually died from the later complications of the infections, so that only a brief statement of the terminal pathology is given by the authors. The results of egg deposition by *S. japonicum* in the liver of rabbits were much more dramatic than those previously observed in smaller laboratory animals. In some instances the eggs in the liver were surrounded by a wide zone of necrotic cells, this zone being in turn surrounded by epithelioid cells lying within a third peripheral zone of dense fibrous tissue.

The *S. haematobium* liver material was obtained from 5 mice (exposed 12–42 weeks previously to 100–150 cercariae) and 13 hamsters (exposed 5–75 weeks previously to 200–500 cercariae). In mice there was a moderate or intense periportal cellular infiltration with polymorphonuclear leucocytes predominating, and large areas of red-staining coagulative necrosis, involving several liver lobules were present in the earlier infections. Eggs were few and were deposited singly or in small groups, a few were surrounded by pseudotubercles, but the majority were empty shells surrounded by giant cells or fibrous tubercles; no worms were seen in any of the liver sections. In hamsters early infections resembled those caused by *S. mansoni*; later infections presented a picture of fibrosis outlining areas of normal parenchyma. Adult worms were frequently encountered in the portal venules, but lesions due to the presence of dead worms were not observed.

Having described the lesions observed in the liver in some detail, the authors conclude their paper with similarly arranged but much briefer accounts of the lesions observed in the intestines, urinary bladders, lungs and spleens of the same animals. *R. M. Gordon*

Price, D. L. **Laboratory Infection of the Agouti,** *Dasyprocta aguti*, **with** *Schistosoma mansoni*. *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 926–29. 2 figs.

The characters of *Schistosoma mansoni* infections in monkeys, hamsters, and mice are somewhat similar to those observable in man, but guineapigs, laboratory rats, cotton rats, gerbils, rabbits and cats show resistance to the parasite and in cases where the infection is successful only a few eggs are passed in the faeces. The author exposed 5 adult agoutis to the cercariae

of *S. mansoni*, and during the subsequent 4 months no evidence of infection was noticeable in the animals other than the presence of eggs in the faeces, which appeared after an interval of 65–72 days. The number of eggs evacuated was always small (9–28 per gramme of faeces) and there were always periods during which no eggs could be demonstrated. All 5 animals were eventually killed and found to be infected with many live male and female adult *S. mansoni*. The authors concluded that:— " 1. The agouti is susceptible to schistosomiasis *mansoni*. 2. The agouti is suitable for laboratory studies with *S. mansoni* which do not require that eggs be passed in the feces."

R. M. Gordon

Ritchie, L. S., Hunter, G. W., Nagano, K. & Pan, C., with the technical assistance of J. McConnaughey, C. Knox, M. Shimizu, S. Asakura & Y. Hishinuma. **The Distribution of the Snail** *Oncomelania nosophora*, **Intermediate Host of** *Schistosoma japonicum*, **along the Tone River, Japan.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 915–25, 4 figs. [14 refs.]

An extensive survey of *Oncomelania nosophora*, the intermediate host of *Schistosoma japonicum*, was made in the Tone River valley from Sakai to Sukayama, a distance of about 75 miles. The survey was carried out by a team of 4 or 5 individuals (sometimes assisted by local volunteers) who devoted at least 15 minutes to searching each of a number of selected sites situated at half-mile intervals. *O. nosophora* was found in 40 of the selected sites, and in 5 of these examinations of the snails revealed the presence of *S. japonicum* cercariae. The area found infested with *O. nosophora* covers a 35-mile stretch of the Tone River valley, extending from the Nagato tributary to Sukayama, and throughout this infested area the snails were found widely scattered in the marshes over hundreds of acres. The authors point out that, in these circumstances, it probably will prove much more difficult to achieve complete eradication of the snails than has been the case in most other endemic centres in Japan, where *O. nosophora* snails are for the most part limited to terminal irrigation ditches and to the damp embankments of terraces; nevertheless, they consider that it may be possible to deal with the situation by applying molluscicides from a helicopter. Fortunately, although snail infections do occur, they are infrequent and cases of infection with *S. japonicum* among the inhabitants of the Tone River valley are relatively rare.

R. M. Gordon

Stransky, E. & Pesigan, Naida E. **Liver Changes in Schistosomiasis in Children.** (Preliminary Report.) *J. Trop. Med. & Hyg.* 1953, Nov., v. 56, No. 11, 261–6, 3 figs. [10 refs.]

Schistosomiasis due to *S. japonicum* is endemic in the rural areas of the Philippine Islands. The disease is stated [by the authors] to cause " irreversible damage to the tissues, especially to the liver ".

Liver biopsy was done on [it would seem 80] patients suffering from schistosomiasis; an account is given of the findings in 7 of these patients, ranging from 6 to 12 years of age, who had evidence of schistosomal involvement of the liver. Steatosis of the liver was a constant finding on biopsy, but fibrosis was minimal. Most patients with schistosomiasis are malnourished, and fatty infiltration of the liver is an invariable precursor of nutritional hepatic fibrosis. But for the local reaction around schistosome eggs the diffuse changes, in the form of steatosis and fibrosis, found on liver

biopsy in these cases did not materially differ from those due to malnutrition. *A. R. D. Adams*

Komiya, Y. & Murase, K. **On the Distribution of various Metacercariae of Trematodes within the Fish Body.** *Japanese J. Med. Sci. & Biol.* 1952, Oct., v. 5, No. 5, 277–92, 1 fig.

Two kinds of fish, *Pseudorasbora* and *Sarcocheilichthys*, were examined systematically to find out the most favoured sites of encystment of different kinds of metacercariae. Seven species of metacercariae were found, which included those of *Clonorchis sinensis*. In *Pseudorasbora* the incidence of *C. sinensis* metacercariae was relatively low, the average number per fish being about 24 per cent. of the total metacercariae found, and the largest number in one fish being 206. In *Sarcocheilichthys* the incidence was high, the average number per fish being 695·7, or 74 per cent. of the total found. In one fish 2,888 metacercariae of *C. sinensis* were found. In both fish the most heavily infested sites were the muscles and adjacent subcutaneous tissues, but considerable numbers of cercariae were also found in the head. Fins, scales and gills showed relatively small numbers. *J. J. C. Buckley*

Yokogawa, M. **Studies on the Biological Aspects of the Larval Stages of *Paragonimus westermanii*, especially the Invasion to the Second Intermediate Hosts (III).** *Japanese J. Med. Sci. & Biol.* 1953, Apr., v. 6, No. 2, 107–17, 4 pls.

The author summarizes earlier work on this subject and states his belief that the cercariae of *Paragonimus westermanii*, unlike those of other trematodes, enter their crab intermediate hosts through the mouth, either indirectly or when the crabs eat the snail first intermediate host when this is infected with the cercariae. To prove this he fed the crabs *Eriocheir japonicus* and *Potamon dehaani* and the crayfish *Cambarus clarkii* with infected livers of the snail intermediate host *Semisulcospira libertina* and successfully infected the crabs and crayfish in this way. The species of crab most often naturally infected, namely, *Eriocheir japonicus* was most easily infected in this manner; the host next most easily infected was *Potamon dehaani*, which is the crab next most often infected naturally; and the host least easily infected was the crayfish *Cambarus clarkii*, which is the host least often naturally infected. The author found that the cercariae required an unexpectedly long time to become metacercariae in the crabs and crayfish. In *E. japonicus* the immature metacercariae were found chiefly in the gill vessels, while in *P. dehaani* they were found mostly in the muscles. The author presumes that the tails of the cercariae are shed in the intestinal canal of the crabs and crayfish and that the cercariae penetrate through the intestinal wall and are carried thence by the blood stream. The fact that the structure of metacercariae from *C. clarkii* resembled that of metacercariae of *Paragonimus kellicotti* raises doubt whether *P. kellicotti* is a valid species. *G. Lapage*

Komiya, Y. & Yokogawa, M. **The Recovering of Paragonimus Eggs from Stools of Paragonimiasis Patients by AMS III Centrifuging Technic.** *Japanese J. Med. Sci. & Biol.* 1953, Apr., v. 6, No. 2, 207–11.

The eggs of *Paragonimus westermanii* are primarily discharged in the sputum, but some may be swallowed and these may be voided in the stools.

The authors repeated 2 to 10 times simultaneous examinations of the sputa and stools of 35 patients suffering from paragonimiasis, using the AMS III technique described by Hunter *et al.* [this *Bulletin*, 1948, v. 45, 623]. For the details of the results obtained the paper itself should be consulted.

The chief results are: of the 35 patients examined 13 (37·1 per cent.) always showed eggs of *Paragonimus* in the sputa examined; and 9 (25·7 per cent.) always showed eggs in the stools examined, but the sputa of 3 of these 9 were invariably negative and it was concluded that they swallowed their sputa. The authors conclude that the habit of swallowing sputa is commoner among children and among people living in rural areas. In children under 12 the rate of recovery of eggs [not the number of positive patients] from the stools was 64·7 per cent., while that of recovery from the sputa was 60·8 per cent.; in patients over 13 years of age the rate of recovery from the stools was 65·2 per cent., while that of recovery from the sputa was 73·9 per cent. In several cases eggs were found only by stool examination. For mass-diagnosis the authors recommend simultaneous examination of sputa and of stools by the AMS III technique.

G. Lapage

Govaert, J. Sur la teneur en acide désoxyribonucléique du noyau des cellules vitellogènes chez *Fasciola hepatica*. [**The Content of Deoxyribonucleic Acid in the Nucleus of the Vitellogenous Cells of** *Fasciola hepatica*] *C.R. Soc. Biol.* 1953, Aug.–Sept., v. 147, Nos. 15, 16, 17 & 18, 1494–6, 1 fig.

Sphangos, J. [**On a Case of Human Distomiasis**] Reprinted from *Nosokom. Chron.* 1953, 5 pp. [In Greek.]

The English summary appended to the paper is as follows:—

"The author describes a case of human distomiasis, due to Distomon [*sic*] Heterophyes heterophyes. The patient was a man 58 years old, complaining in particular of strong pains in the upper abdominal region, extending towards the stomach and the right hypochondrium, of diarrhoea, occasionally mucous, alternating with constipation, of depression and loss of appetite. Examination of feces, by the author, showed a great number of eggs belonging to the above mentioned species. The infection was due to the consumption of fish of the species Mugil cephalus, which is the intermediary host of the Distomon Heterophyes heterophyes and is plentiful in the Missolonghi region, whence the patient came. He often ate fish of this kind, salted or smoked. It is to be noted that no mention of the presence of this parasite in Greece or other European countries exists in the relative bibliography. This article was communicated to the members of the Medical Union of the "Evanghelismos Hospitals" on April 25th, 1953, in Athens, Greece, and slides of eggs of this parasite were also demonstrated to them."

Guilbride, P. D. L. **Veterinary Public Health. The Importance of Animal Disease to Public Health in the Caribbean with special reference to Jamaica. Part V. Parasitic Infections.** *West Indian Med. J.* 1953, Sept., v. 2, No. 3, 205–23. [70 refs.]

"(1) A survey of the parasitic diseases common to animals and man in the Caribbean has been described.

" (2) The limited occurrence of *Taenia saginata*, *T. solium*, *Echinococcus granulosus* and *Trichinella spiralis* is pointed out.

" (3) Reference is made to the high incidence of human infections with *Fasciola hepatica* in Cuba."

Pardi, M. C., Duarte, G. G. & Rocha, U. F. Cisticercose em bovinos e suinos. (Análise estatística de dados colhidos pelo S.I.F. No. 2, do D.I.P.O.A., do Ministério da Agricultura, junto ao Frigorífico Anglo de Barretos, Estado de São Paulo, Brasil.) [**Bovine and Swine Cysticercosis (Statistical Analysis of Data from the Federal Inspection Service, Agriculture Ministry, Brazil)**] *Rev. Facul. de Med. Vet.* São Paulo. 1952, Dec., v. 4, No. 4, 613–28, 4 graphs. English summary.

The data on which these figures are based were obtained from the Cold Storage Plant in São Paulo in the 12 years 1941–52. Bovines slaughtered numbered 1,838,069 and pigs 133,817. At inspection of the former incision was made in each case into the muscles of mastication, the tongue and the heart, and at times the viscera and skeletal muscles were inspected. If only a single calcifying or calcified larva was found the carcase was passed as fit for consumption after removal of the lesion; if there were several, but not many, permission was given for curing; if more numerous the carcase might be used for obtaining lard; if very many it would be condemned. In the case of pigs the inspection was more cautious, with incisions of the heart and tongue, examination of the pharynx and oesophagus, and, finally, more minute examination of the diaphragm, the skeletal muscles and the viscera.

Of the bovines, 35,483 (1·93 per cent.) were found infected; in the State of Minas Gerais 2,538 among 187,745 (1·35 per cent.), in Goiaz 250 among 25,073 (1·0), in Mato Grosso 57 among 6,615 (0·86) and in São Paulo 22,534 among 1,162,016 (1·92 per cent.). In nearly all, " more than 99% " the infected animals the cysticerci were present in the masticatory muscles or the heart. A detailed table gives the different parts of the carcase in which the cysticerci were found: in the masticatory muscles in 23,523 of the 35,483 infected; in the heart in 10,520; in both these in 669. Of the 133,817 pigs slaughtered, 7,447 (5·56 per cent.) were infected; in São Paulo, 6,342 among 114,477 (5·54), in Minas Gerais, 1,060 among 18,457 (5·6), in Goiaz, 41 among 789 (5·2) and in Mato Grosso, 4 among 98 (4·0).

It will be seen that the incidence among swine is much greater and the infection is more widespread in the body. The masticatory muscles, tongue, heart and skeletal muscles were affected in 4,578, the heart only in 764, the tongue alone in 475 and the masticatory muscles in 354. In short, the infection is much more serious in swine, not only in the proportion infected but in the wide distribution in their bodies. *H. Harold Scott*

Parodi, S. E. & Alcaraz, R. A. Actividad biológica propria del embrión hexacanto de los cestodes. [**Autogenous Biological Activity of Cestode Hexacanth Embryos**] *Semana Méd.* 1953, Nov. 19, v. 103, No. 21, 731–3.

The belief has been held in the past and, in fact, is maintained by many today, that the cestode embryo is acted upon by the digestive juices, the cell wall being dissolved and the embryo itself thus set free to continue

its life history in the intestine. The authors report their own observations and quote those of Parodi, Alcaraz and Vanni on *Hymenolepis diminuta*, of Bacigalupo on *H. nana*, of Penfold, Boyd and Phillips on *Taenia saginata*, and *T. solium*, of Parodi and Alcaraz on *T. serialis*, a common cestode of the dog, and of Devé on *Echinococcus granulosus*. [These are spoken of but no references to the literature are given.] They state that the digestive juices play no part, at all events no direct part, in liberating the embryo, but that the hooklets come into contact with the shell and the two median hooklets rotate rhythmically and thin the wall till they make an aperture through which the embryo escapes. *H. Harold Scott*

Simitch, T., Nevenitch, V. & Petrovitch, Z. *Citellus citellus* animal de choix pour démontrer l'identité biologique entre *Hymenolepis nana*, de l'homme, et *H. nana* var. *fraterna*, du rat. [*Citellus citellus* **as a Suitable Animal for Demonstrating the Biological Identity of** *Hymenolepis nana* **of Man and** *H. nana* **var.** *fraterna* **of the Rat**] *Arch. Inst. Pasteur d'Algérie.* 1953, Mar., v. 31, No. 1, 84–90. [17 refs.]

The authors' summary in French is freely translated as follows:—

Citellus citellus is a suitable animal for demonstrating the biological identity of *Hymenolepis nana* of man and *H. nana* var. *fraterna* of the rat, and also for studying infection, reinfection and hyperinfection by this parasite. For the study of these problems three series of experiments were carried out with *Citellus* whose faeces contained only eggs of the *H. nana* type. In the first series, the infection was followed up in 10 *Citellus* which had received orally the eggs of *H. nana* obtained in the faeces of a naturally infected *C. citellus*. As a result of these experiments we have demonstrated that *H. nana* of man and that of *C. citellus* are entirely identical. In the second series we followed up the infection of *Citellus* which had received separately the eggs of *H. nana* of man, of *C. citellus* and of the rat (white rat). As a result of these experiments we have shown that there is no biological difference between these 3 strains of *Hymenolepis*. In the third series, we studied reinfection and hyperinfection by *Hymenolepis* in *Citellus* previously infected with *H. nana* from man, from *C. citellus* and from the rat. As a result we have established that *C. citellus* can be reinfected equally well by different strains as by similar strains of *Hymenolepis*.

Hyperinfection of *C. citellus* in the laboratory corresponds with constant reinfection by auto-infection. In the large intestine of *C. citellus* which died as a result of hyperinfection, thousands of parasites were found in all stages of development, from very young cysticercoids to adult parasites.

J. J. C. Buckley

Peralta Díaz, E. & Mazzotti, L. La atebrina en al tratamiento de las parasitosis por *Hymenolepis nana*. [**Mepacrine in the Treatment of** *Hymenolepis nana* **Infection**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1953, June, v. 13, No. 2, 121–5.

The English summary appended to the paper is as follows:—

"18 patients infected with *Hymenolepis nana* were treated with atabrine according to dosage recommended by other authors.

"The cure was effective only in five patients (37%). In several of the others, the treatment failed even after repeating it two or three times."

Baldomir, J. M., Joaquin Canabal, E., Dighiero, J., Purcallas, J., Aguirre, C. V. & Suzacq, C. V. Valor del electrocardiograma para establecer el diagnóstico diferencial entre los aneurismas y los quistes hidáticos del ventrículo izquierdo. [**Value of the Electrocardiogram in Differential Diagnosis between Aneurysm and Hydatid Cyst of the Left Ventricle**] *Archivos Uruguayos de Med., Cirug. y Especialidades.* 1953, May–June, v. 42, Nos. 5/6, 273–91, 5 figs. [26 refs.]

The English summary appended to the paper is as follows:—

"The authors report four cases in which the clinical, as well as the radiologic study led them to establish the differential diagnosis between an aneurysm and a hydatid cyst of the left ventricle. By means of the electrocardiogram the diagnosis of hydatid cyst was ruled in.

"They describe the electrocardiographic pattern of the pseudo-tumoral form of echinococcus disease of the left ventricle, establishing at the same time a clear cut opposition between this pattern and that of ventricular aneurysm.

"While the 'aneurysm type' electrocardiogram has characteristic wide, pathologic Q waves followed by persistently elevated RS-T segments and inverted T waves, the 'hydatid cyst type' electrocardiogram shows no abnormal Q waves but R waves of varying amplitude, rapid downstroke of S waves (intrinsicoid deflection), isoelectric RS-T segments and definite inversion of T waves. These changes are much more obvious in the leads recording the potential variations of the ventricular wall underlying the cyst.

"R waves exhibit different amplitude, according to the thickness of the myocardium where the cyst is grounded. S waves sometimes show slight slurring in its descending branch, apparently due to local disturbances in intraparietal conduction of the excitation process.

"The above mentioned changes are present in multiple precordial leads. Unipolar limb leads and standard leads usually display changes of lesser degree of no diagnostic significance."

Özsan, K. Şarkî Karadeniz bölgesinde Nekator taramasi. [**Faecal Examinations for Hookworm Infection in the Eastern Coastal Region of the Black Sea**] *Türk Ijiyen ve Tecrübî Biyoloji Dergisi.* Ankara. 1953, v. 13, No. 2, 178–9. French version 180–82.

This study was made in an area along the Black Sea coast of Turkey between the town of Ordu and the Russian frontier: the presence of hookworm disease in the country appears to be limited to this region.

The region is mountainous and the mountains are separated by rivers and streams into narrow valleys in the neighbourhood of which villages are scattered: the climate is mild and humid and is very favourable to the development of hookworm. As one gets away from the coast and the low valleys, the degree of hookworm infection decreases and in the fresh and drier region it disappears altogether.

Several communities were surveyed and the aim was to examine a stool specimen from each person except the very young and very old. The results are shown in a table which indicates that in fact about half of the population of 152,999 in 14 communities were examined. The percentages found positive for hookworms [it is stated that no differentiation was made between the species] varied between 0·3 and 53, with an average of 30.

It is pointed out that on the mountains sweeping down to the sea there are only narrow strips of cultivable land between the valleys and the coast:

the people are thus economically very poor and human faeces are used as manure, thus aggravating the spread of hookworm disease.

H. J. O'D. Burke-Gaffney

Brumpt, L. C. & Ho Thi Sang. Diapause des ankylostomes chez les grands anémiques. [**Diapause of** *Ancylostoma* **in Cases of Severe Anaemia**] *C.R. Soc. Biol.* 1953, June, v. 147, Nos. 11/12, 1064–6.

The larval diapause of the nematode genus *Ancylostoma* is well known and the authors refer to the work of Howard [this *Bulletin*, 1918, v. 12, 184], who found eggs of *Ankylostoma* in the faeces of a child aged 14 days, although the normal development to the egg-laying stage is 36 days; and Foster [this *Bulletin*, 1933, v. 30, 221], who found that 20 per cent. of the larvae passed into the foetus of the dog, in which they remained latent until birth, and then killed the dogs 25 days later.

The authors' studies of anaemic patients with ankylostomiasis in Northern Vietnam suggested that the worms could not become, in these patients, mature, but that, when the anaemia was cured, they were able to mature. Thus, in certain patients with macrocytic and hypochromic nutritional anaemia the egg counts showed that, when eggs were absent or few at the beginning of the examination, they increased in number when the anaemia was treated; and, when patients with severe helminthic anaemia were treated for anaemia without any anthelmintic, the egg counts progressively increased.

A possible explanation is that the egg production of these blood-sucking worms decreased because of the poor quality of the blood they ingested, but this could hardly explain complete or prolonged suppression of egg production and there was also the possibility of infestation or reinfestation during the period of the examination of the patients, which could have occurred in the infected gardens of the Hanoi hospital where the patients were, although some of them were strictly confined to bed for periods longer than the time required for complete development of the worms.

Several hundreds of worms, most of them immature, were recovered from the patients by anthelmintic treatment and among them were small worms in the larval stage. A second anthelmintic treatment, given when the anaemia began to respond to treatment of it, still produced immature worms and some worms *in copula*. Succeeding anthelmintic treatments expelled worms larger and larger and female worms were predominant. Thus the males and the immature worms were less resistant to the anthelmintics than the normal and the female worms. This confirms the work of Tenholt (cited by Calmette and Breton (*L'Ankylostomiase*, Masson, édit. 1905)), who noted, in 1903, that anaemic patients got rid of their ankylostomes more easily than otherwise healthy patients did.

The authors conclude that the diapause of these worms explains why it is easier to get rid of them before treating the anaemia that they cause. Careful anthelmintic treatment should accompany treatment of the anaemia. The authors discuss the view that treatment of the anaemia is more important than anthelmintic treatment and they disagree with this view, because, when they tried this method of treatment, the worms in diapause matured when the anaemia improved and their egg production increased and anthelmintics had to be given to break this vicious circle. The authors avoided oil of chenopodium, thymol and carbon tetrachloride, because of their toxicity and hexylresorcinol and diethylcarbamazine, because they were not sufficiently effective. They commend careful use of tetrachlorethylene given once in doses of 3 to 5 gm. with or without a following purge, according to the condition of the patient. *G. Lapage*

Huehns, E. R. **Filariasis in Mauritius.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 549–55, 1 map & 1 graph. [14 refs.]

A blood survey was carried out in 17 villages in Mauritius, covering the whole island and including the 2 main towns, Port Louis and Curepipe. At each place an effort was made to examine more than 100 persons. All surveys were commenced between 9.30 and 10.0 p.m. A comparison was made between the dermal smear method of van den Berghe and Chardome [this *Bulletin*, 1951, v. 48, 1067] and the thick blood smear; the former was not adopted as the number of parasites found was always smaller. The total number of people examined was 2,630; of these 1,930 were civilians and 700 Mauritian recruits to the Royal Pioneer Corps.

In civilians the microfilarial index was 11; in males 12 per cent., and in females 10 per cent. were infected. Age incidence followed the general rule and a maximum of 21 per cent. was revealed in the fifth decade. The youngest infected persons was a boy of 4, one of 305 children examined.

In Mauritian recruits the figures were much lower, averaging 8 per cent. In 3 age groups—under 20, 20–29, 30–39 years—the percentage incidence among civilians was twice as high as that in soldiers.

The periodicity was ascertained in 10 soldiers and showed a definite nocturnal rise with a drop in numbers of microfilariae at midnight in 8 cases. A definite correlation between microfilaraemia and mosquito activity was demonstrated. The species concerned were *Culex fatigans*, *Anopheles gambiae* and *Anopheles maculipalpis*. The infection appears to be specially benign. Though elephantiasis is a well known disease, it is infrequent in comparison with the number of persons infected with filariasis. The topographical incidence in 17 places surveyed is shown in a map and in a table: the cases tended to occur in groups. *Philip Manson-Bahr*

Huard, P. La chylurie à Hanoï. [**Chyluria in Hanoi**] *Bull. Acad. Nat. Méd.* 1953, v. 137, Nos. 28/29, 486–92, 2 figs. [12 refs.]

Filariasis is intensely endemic in the Provinces of Bac-Giang, Hai-Doung, Thai-Bingh and Hadong, and plays an important rôle in the pathology of North Vietnam. It was shown by Galliard that in addition to *W. bancrofti*, *W. malayi*, hitherto unrecognized in Indo-China, plays a part. Besides a number of healthy carriers of microfilariae, some 40 per cent. of those in hospital suffer from chyluria. Huard *et al.* have studied 102 cases of this complication.

Firstly "chyloid" urines must be eliminated—that is pyuria, bacilluria, lipuria, galacturia, phosphaturia, and urines with excess of urates. In true chyluria there is an excess of lipids, proteins, fibrin and leucocytes, which cause coagulation. Thus one can distinguish lymphochylous (27 per cent.), pyolymphochylous (10 per cent.), and haematolymphochylous (63 per cent.) varieties. With suitable dietary restrictions, chyluria may possibly be transformed into lymphuria. General signs (fever, headache, lumbar pains) predominate, but soon strangury and acute retention of urine may supervene. About 5 per cent. may begin with haematuria. Chyluria tends to become chronic with quiescent intervals of variable duration, and it may recur many years after apparent cure. The prognosis in pure aseptic lymphochyluria is on the whole good and there are records of patients dying as octogenarians with a chyluric history of 50 years. A second group comprises those with haematopyochylolymphuria without irreversible renal function changes and susceptible to treatment: a third consists of a similar condition, but having chronic nephritis and irreversible renal changes.

That the filaria is almost invariably the cause of chyluria is hardly open to doubt. The embryos of *W. bancrofti* can be demonstrated in the urine, in the blood (55 per cent.) or in the genito-urinary lesions (16 per cent.). The parasites may also be found in the ascitic or hydrocele fluid, in the gland pus, some organs and rarely in the cerebrospinal fluid. Complement-deviation tests with *D. immitis* antigen, as well as intradermal reactions, were of positive assistance in 60 per cent.

Cystoscopy is frequently difficult on account of the clots which are often present in the meatus, but never have lymphatic varices, or lympho-vesical fistulae been demonstrated by the author in this way. Pyelography is essential. By this means usually a " bundle of hair " appearance is obtained in the renal pelvis which denotes a chylous fistula, but this image may be absent in some chylurics. The appearance may be difficult to interpret on account of extravasation of opaque fluid by rupture of the papillary sinus. Intravenous pyelography provides excellent means of assessing renal function, but almost never of the appearance of pyelo-lymphatic reflux.

Treatment must be followed up for a long time, bearing in mind the cyclic character of the disease. Although a certain degree of success has been obtained with arsenicals, results of which were spectacular in one case, piperazine derivatives have been a great improvement (notably with the preparation 3799 R, or notézine). It is suggested that mass treatment with this drug would result almost in the disappearance of chyluria. In acute cases it is very successful, but in the chronic it is less satisfactory. Endoscopic treatment with lavage is indicated as a method of removing clots which may produce retention. Lavage of the renal pelvis with collargol and silver nitrate has been used with temporary relief. Radiotherapy has been applied to the dorso-lumbar and epigastric regions. Surgical measures consist of cystostomy when there is blockage of the bladder and nephrectomy for an incurably infected kidney.

Philip Manson-Bahr

McFadzean, J. A. **The Effect of Adrenocorticotropic Hormone on Elephantiasis of the Lower Limb.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 561–3.

In this paper the results of treatment of 5 cases of elephantiasis of the lower limbs with ACTH in the Gambia are described. A novel method of measuring the size of the leg by water displacement was employed by filling a bucket, approximately 12 inches in diameter and 16½ inches deep, with water. On inserting the leg the level of the water was raised until it overflowed. The leg was then withdrawn and the excess water shaken into the bucket. By filling the bucket with water from a 1-litre measuring cyclinder until it began to overflow, it was possible to make readings of a normal leg in this manner. In 10 readings standard deviation was 25 cc.

For accurate determination a scheme of conditions was evolved. After the patient had moved about for 2–3 days, without elevating the legs, the limb was measured until a fairly constant maximum figure was obtained. This was followed by complete rest in bed and application of a crêpe bandage. When a steady minimum reading was secured, ACTH therapy was commenced with 12·5 mgm. dosage at 6-hour intervals for 2 days, followed by 15 mgm. every 6 hours for 2 days, and 20 mgm. every 6 hours for 4 days. Patients were weighed daily and given a high-protein, salt-restricted diet, a restricted fluid intake, and 0·5 gm. potassium acetate 3 times daily. The number of eosinophiles in 300 to 400 white cells was

counted. During dosage with ACTH there was no alteration in eosinophilia in one patient, some decrease in a second and a fall to zero in the third. This apparently bore no relation to the condition of the leg.

There was marked reduction in size of elephantoid legs with rest in bed—up to 53 per cent.—and it became clear that ACTH had no real effect on elephantiasis of the legs due to *W. bancrofti*. *Philip Manson-Bahr*

Hamon, J. Apparition à la Réunion d'une résistance au DDT chez *Culex fatigans* Wiedemann, principal vecteur de la filariose à *Wuchereria bancrofti* dans l'île. [**The Appearance in Reunion of Resistance to DDT by** *Culex fatigans*, **the Principal Vector of** *Wuchereria bancrofti*, **in the Island**] *Bull. Soc. Path. Exot.* 1953, v. 46, No. 3, 454–63, 3 graphs. [21 refs.]

An antimalarial campaign based on the treatment of the interior of houses with 5 per cent. DDT in petroleum was started in the Island of Reunion, 1,000 km. east of Madagascar in 1948. This campaign began in St. Denis but was extended in subsequent years to cover all parts of the island less than 500 m. in altitude. The first campaign in 1949 to 1950 against adult mosquitoes was entirely satisfactory, but by 1951 DDT was not giving an adequate control of mosquitoes, and particularly of *Culex fatigans*. In 1950 control measures were extended to treatment of the larvae with DDT. Analysis of the DDT in the laboratory proved that the insecticide was of good quality.

Mosquito larvae, *Culex fatigans*, collected in the area of St. Denis were taken to the laboratory, and the adults obtained from these stocks were introduced into cages with sides covered with Bristol board treated with 5 per cent. DDT in petroleum. After 30 minutes the mosquitoes were transferred to clean cages and examined at regular intervals. The mosquitoes fell on to their backs, but after 48 hours 53 per cent. females and 19 per cent. males had recovered.

Adult mosquitoes captured on surfaces treated with DDT in the field were taken to the laboratory, fed and observed over 4 days. All female mosquitoes and 42 per cent. males survived.

Observations made in 5 areas where DDT had been used against the larvae either as a wettable powder or as a solution in fuel oil showed that the insecticide was not giving adequate control.

Larvae of *Culex fatigans* collected in different parts of the island were examined for resistance to DDT and to *gamma* BHC in the laboratory. The strain from Tampon (an area never receiving anti-larval measures) proved to be very susceptible to DDT and to *gamma* BHC. A strain from St. Paul town which had received 2 anti-larval and 2 anti-adult treatments was more resistant to both DDT and *gamma* BHC, while a strain from Cap Bernard which had received 3 anti-adult and 3 anti-larval treatments was much more resistant to DDT and also to *gamma* BHC.

Resistance in Reunion has appeared generally one year after either an anti-adult or an anti-larval campaign was started. *C. M. Harrison*

Kartman, L. **On the Problem of Non-Infective Microfilariae.** *J. Parasitology.* 1953, June, v. 39, No. 3, 296–9.

This work was undertaken to see if the age of microfilariae influences ability to develop in the mosquito host. Batches of *Anopheles quadrimaculatus* were fed at various intervals up to 4 months on a dog which had received microfilariae of *Dirofilaria immitis* in transfused blood.

"1. *Anopheles quadrimaculatus* females, fed upon an uninfected dog transfused with *Dirofilaria immitis* microfilariae from an infected dog, showed normal filarial development up to three months subsequent to the transfusion.

"2. Encapsulation of some infective larvae of *D. immitis* was noted in *A. quadrimaculatus* during the first month following the transfusion.

"3. Failure of new born *D. immitis* and all but a few *Foleyella brachyoptera* microfilariae to develop in the mosquito suggests that these parasites may have to undergo a short aging period before they attain maximum infectivity for the mosquito host."

Galliard, H. & Larivière, M. Recherches sur l'éosinophilie au cours de la filariose à *Loa loa* et de son traitement. Effets de l'A.C.T.H. et résultats des tests d'insuffisance surrénale. [**Studies on Eosinophilia during *Loa loa* Infection and Its Treatment. Effects of ACTH and Results of Tests of Suprarenal Insufficiency**] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, No. 4, 312–20, 3 figs.

One case of *Loa loa* infection (with *D. perstans* also present) was studied, before and after treatment, with a view to determining the significance of the Thorn test and the reasons underlying the absence of a reduction in the associated eosinophilia in this infection. Comparative enumeration of the microfilariae was made in the venous and capillary blood. They showed considerable differences in numbers at the same time, but no difference in relative numbers as affecting the periodicity. The venous blood contained the greater numbers of microfilariae; the leucocytosis and eosinophilia did not vary at all. Treatment with Hetrazan [diethylcarbamazine], in small doses, provoked oscillations of the same order, but not of the same amplitude. On the fourth day the microfilariae in the venous blood increased, but disappeared from it 5 days after their absence from the capillary blood. Several days after this event the small numbers of microfilariae of *Dipetalonema perstans* also disappeared.

Three Thorn tests with ACTH (25 mgm. by the intramuscular route), one prior to treatment, and two 21–31 days later, gave consistently negative results [in normal persons and those in whom the adrenal cortex is not diseased, this test results in a fall of circulating eosinophiles]. In addition to the failure of the eosinophiles to fall in numbers, the number of lymphocytes rose. At the same time the excretion of 17 keto-steroids and of cortisone remained normal.

A considerable increase in the number of leucocytes (up to 26,640 per cmm.), and of eosinophiles (21,376) was produced from the eighth to twenty-first day, possibly as the result of Hetrazan treatment. Possibly, also, this may constitute a new test with ACTH, there being after the twenty-first day or at the end of treatment a progressive reduction of the leucocyte and eosinophile curves.

With a view to explaining if this irreducibility of eosinophiles during the course of the conventional Thorn test (25 mgm. ACTH intramuscularly and enumeration at the end of 4 hours) may be due to a diminution of secretion of the suprarenal cortex, a perfusion of ACTH (10 mgm. intravenously during 4 hours) was carried out on the 62nd day. At this time the reduction of eosinophiles was considerable (from 9,000 to 593 in the sixth hour). Some 24 hours later the eosinophile tide was re-established and remained at that figure till the observation terminated (85 days later). A final test (25 mgm. ACTH intramuscularly) carried out 37 days after the perfusion demonstrated the persistence of the relatively high level of the eosinophiles.

Philip Manson-Bahr

Ribeiro, A. L. **A Case of Dracunculiasis (Guinea-Worm) in Nairobi.** [Memorandum.] *Brit. Med. J.* 1953, Dec. 12, 1310, 1 fig.

This note records a case of guineaworm infection in an Indian in Nairobi. The lesion was between the last two digits of the left foot and the only general symptoms were pain in the knee and groin. The whole worm, which measured 60 cm., was extruded in 23 days.

The patient had been in India some 9 months previously and had heard of more than 200 cases of *Dracunculus* infection in Jamnagar, where he was staying. He had drunk unboiled well water.

H. J. O'D. Burke-Gaffney

Gaud, J. Gongylonémose humaine au Maroc. [**Human *Gongylonema* Infection in Morocco**] *Bull. Inst. Hyg. Maroc.* 1952, v. 12, Nos. 1/2, 83–6, 2 figs. on 2 pls.

The first of the two cases described has already been reported [this *Bulletin*, 1951, v. 48, 667].

The second relates to a woman of 21 who came to Morocco from France in 1932 and had remained there since. In 1952, she reported that for some days she had felt a foreign body in the mucous membrane of the lower lip and on extraction this proved to be a male *G. pulchrum* measuring 32 mm. × 200 μ. Details and measurements are given and there is a photographic illustration.

The author discusses the possible sources of infection. It is believed that the common intermediate host is one of the Scarabeidae, but the cockroach *B. germanea* has proved a satisfactory experimental host, and these insects are common in Morocco. The author asks whether the infection is as rare in man as is generally held. In animals the usual site is the oesophageal or rarely the gastric epithelium and the author wonders whether there may be an unrecognized oesophageal localization in man. He refers to Ghett in Italy who failed to find such an infection at autopsy in 29 persons with gastric ulcers. The question of the means of transmission appears to be still open to doubt.

H. J. O'D. Burke-Gaffney

DEFICIENCY DISEASES

Kenya. **Medical Department. Records of the Medical Research Laboratory No. 10. The Chemical Composition of some Kenya Foodstuffs** [Harvey, D.]. 12 pp. 1951. Nairobi: Govt. Printer.

Walker, A. R. P. & Arvidsson, U. B. **Iron "Overload" in the South African Bantu.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1953, Nov., v. 47, No. 6, 536–48. [Numerous refs.]

Various foodstuffs, including kaffir beer, take up large quantities of iron from the vessels in which they are cooked and prepared. As a result the Bantu's iron intake is much higher than is normal for Europeans and may be up to 200 mgm. a day. Urinary excretion is never high and a maximum of 0·7 mgm. per day was found. By contrast specimens of stools may contain enormous amounts—up to 360 mgm. This dietary overload, it is postulated, may break down the mucosal barrier in the intestines and an excess is absorbed. As it cannot be excreted, it is stored in the organs.

This process may account for the well-marked siderosis so commonly found in the tissues of Bantus at post mortem, whatever the cause of death [this *Bulletin*, 1946, v. 43, 666]. There appears to be no evidence that this excess iron in the tissues is *per se* detrimental to well being. It may account for the rarity of hypochromic anaemias in the South African Bantu.

This paper contains a good bibliography and an excellent discussion of siderosis. *R. Passmore*

Ferro-Luzzi, G. **Kwashiorkor in Eritrea.** Reprinted from *Boll. Istituto Alimentazione e Dietologia.* 1952, v. 3, No. 1, 24 pp., 9 figs. [71 refs.]

This article consists of general remarks on kwashiorkor which is rare in Eritrea (although infant malnutrition is rife there) because, it is thought, millets such as *Eragrostis* [" Abyssinian teff ", a local grass] and sorghum, have a protective action. Two cases are described in detail, one in a girl of 4 years who had been breast-fed for 2 years and then lived largely on cakes of *Eragrostis* and maize, but was never given any milk. She showed general oedema and crazy-pavement skin and was apathetic on arrival at hospital. The other patient was a boy of 2 years who similarly presented a state of general anasarca and skin lesions. Both were typical and the skin lesions are well shown in photographs. The first patient died, but an autopsy was not obtained: the second was removed, in coma, by the parents; liver tissue was obtained from the patients by biopsy acupuncture, and photomicrographs depict well the fatty changes in the liver.

H. Harold Scott

Oomen, H. A. P. C. **Infant Malnutrition in Indonesia.** *Bull. World Health Organization.* Geneva. 1953, v. 9, No. 3, 371–84, 8 figs.

Evidence of widespread malnutrition in Indonesian children is described. Children of pre-school age are most severely affected and especially children of small wage-earners, who own no land and live in densely populated quarters. Kwashiorkor, xerophthalmia and keratomalacia are the most important diseases. Blindness due to the last is not as common in Indonesia as might be expected, but this is because many of the affected children die.

The preventable nature of these diseases is stressed. Nutrition education based on maternity clinics is advocated. These are preferable to general hospitals. Regular advice on the feeding of toddlers is needed more than on the feeding of infants. *R. Passmore*

Oomen, H. A. P. C. **Preliminary Survey on Malignant Malnutrition in Djakarta Toddlers.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, Sept., v. 5, No. 3, 193–214, 1 chart, 3 graphs, 12 text figs. & 5 coloured figs. on pl. [12 refs.]

This paper gives a more detailed account of the clinical picture, dietary history and social circumstances of the conditions described in the previous report [above]. A special feature of kwashiorkor in Indonesia is the high incidence of xerophthalmia (75 per cent. in this survey). Rice was the basic diet of all these children.

There was a striking contrast between the appearance of these ill-fed children and their mothers. Most of the mothers looked well-nourished,

tidy and neatly clothed. Primary poverty was probably only a minor cause of the children's condition. Maternal ignorance appeared to be more important and the necessity for facilities for education in child feeding is stressed. In nearly 20 per cent. of the cases there had been no mother to nurse the infant and in many of these there was evidence of neglect by the foster parent. *R. Passmore*

SPRUE

Adlersberg, D., Colcher, H. & Wang, C. I. **Oral Use of Hydrocortisone (Compound F) in Treatment of Sprue.** *Arch. Intern. Med.* 1953, Nov., v. 92, No. 5, 615–27, 3 figs. [Refs. in footnotes.]

This study is mainly concerned with the effects of hydrocortisone in patients with intractable primary sprue (idiopathic steatorrhoea). Two forms of this steroid were used, the acetate and the free alcohol. The former proved ineffective, but the latter, given by the mouth, was found to be a valuable therapeutic agent in the treatment of these patients.

The diagnosis of *primary* sprue was based upon the generally accepted symptoms and signs together with polyavitaminosis, sometimes the condition was associated with hypocalcaemia, tetany, osteoporosis and hypoproteinaemia. X-ray studies failed to reveal evidence of organic disease in the gastro-intestinal tract which is said to be found in *secondary* sprue.

Although many patients showed partial improvement on a sprue regimen of a high protein diet, with limitation of fats and polysaccharides and supplemented with adequate doses of liver extract, vitamin B12 and folic acid, in some no remission could be achieved. Finally, there were some who after many years of satisfactory response developed resistance to any form of hitherto accepted treatment, and their condition progressively deteriorated. On these considerations 6 of this latter group were treated with prolonged courses of cortisone or corticotrophin or both [Adlersberg *et al.*, *Gastroenterology*, 1951, v. 19, 674; Colcher *et al.*, this *Bulletin*, 1953, v. 50, 843].

The present series consisted of 3 men and 14 women, ranging in age from 30 to 70 years, averaging 49. Duration of symptoms varied from 2 to 45 years, averaging 12. (Details of the haematological findings and biochemical studies are stated.) The first therapeutic trials were made with hydrocortisone acetate administered in 7 courses to 5 patients who had previously received cortisone or corticotrophin therapy. The results are summarized in a table. The following is an example: a 55-year-old European who had the disease for 23 years with maximum weight loss of 40 lb. One of the chief manifestations was severe purpura caused by marked hypoprothrombinaemia and another was severe osteoporosis. For 1½ years prior to this study the condition was maintained on almost continuous cortisone or corticotrophin therapy. The average dose was 35 mgm. by the mouth but the replacement by hydrocortisone acetate in daily doses of 80 mgm. resulted in deterioration. On admission to hospital hydrocortisone acetate was given by intramuscular injection in doses of 125 mgm. daily for 14 days: weight loss and all appearances of a severe relapse ensued. At this time hydrocortisone free alcohol was given with very satisfactory effects (Course 4). The initial daily dose was 80 mgm.; with this treatment the diarrhoea ceased and his vigour returned. However, a third trial of hydrocortisone acetate (Course 5) again provoked serious symptoms—diarrhoea and weight loss. A subsequent course of oral hydrocortisone free alcohol

proved very effective. The initial daily dose of 60 mgm. could be gradually reduced to 20 mgm., but cessation of this therapy led to relapse within several days. Since January, 1953, with uninterrupted oral hydrocortisone free alcohol the weight returned to 125 lb.; the patient is now employed, and has one formed stool daily.

Hydrocortisone free alcohol was administered subsequently to 17 patients in 21 courses. In the first group of 5 hydrocortisone free alcohol, given in an initial daily dose of 40 to 80 mgm. replaced oral cortisone in 3 courses: in 2 courses it replaced intramuscular corticotrophin-gel: in 3 courses it was administered at the height of relapse precipitated by hydrocortisone acetate; and in one course it was given during relapse from interruption of therapy. Group 2 consisted of 12 who were given hydrocortisone free alcohol 80 mgm. daily as an initial dose. In both groups a remarkable change occurred in 2 to 7 days. Weakness and apathy were replaced by euphoria and a sense of well-being. The stools became normal: gain in weight paralleled the improvement, averaging 7 lb. per course. Steatorrhoea diminished when large doses were used. The effect of hydrocortisone free alcohol upon the serum levels of vitamin A and the vitamin A tolerance test was similar to those of cortisone and corticotrophin therapy. In those with hypoalbuminaemia a decided increase of serum albumin was noted. In X-ray studies of the small intestine there was significant improvement of the sprue pattern under steroid therapy.

The initial dose of hydrocortisone free alcohol was 80 mgm. daily in 2 to 4 divided doses. Maintenance doses of 20 to 30 mgm. daily were given in one dose, half an hour before breakfast.

Patients in this therapy were placed on a low fat, high protein diet with limitation of starches, and the sodium content was reduced to 500 mgm. per day.

During treatment the previous " basic " anti-anaemic therapeutic regimen (liver extract, vitamin B12 and folic acid by injection) remained unchanged.

Though the rôle of the adrenal cortex in the aetiology of sprue has not been established, clinical observation supports the conception that diminished adrenocortical reserve may play a part in some cases. Thus pregnancy, though it is well tolerated by sprue patients in the first and second trimesters, may lead to severe relapse before or after parturition, suggesting gradual exhaustion of the adrenocortical reserve. Hydrocortisone free alcohol offers advantages in comparison with cortisone and corticotrophin, being effective in small doses without producing side effects.

Philip Manson-Bahr

HAEMATOLOGY

Itano, H. A. **Solubilities of Naturally Occurring Mixtures of Human Hemoglobin.** *Arch. Biochemistry.* 1953, Nov., v. 47, No. 1, 148–59, 2 figs. [20 refs.]

Jelliffe, D. B. **Serum Proteins in the Newborn African.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1953, Sept., v. 5, No. 3, 286–8. [15 refs.]

" Cord blood from 34 West African newborn babies was analysed for serum proteins by the micro-Kjeldahl method. The results were found to be within a similar range to values found elsewhere in Caucasian neonates."

Jelliffe, D. B. **Observations on Sickle-Cell Disease in Jamaica.** *J. Trop. Med. & Hyg.* 1953, Nov., v. 56, No. 11, 257–61, 1 map & 1 fig. [71 refs.]

The 1943 census showed that of the 1,237,063 Jamaican inhabitants 78·1 per cent. were predominantly African and 17·5 per cent. Africo-Caucasian or Africo-Asian mixtures; 2·1 per cent. were East Indians, 1·1 per cent. Caucasians and 1·0 per cent. Chinese. A survey is referred to in which 2,116 Jamaican children were tested by the Scriver and Waugh technique for sickle cells. Chinese, East Indians and Caucasians showed no sickling, but of the 1,267 "average" Jamaican schoolchildren of mixed Africo-Caucasian descent 5·7 per cent. were found to be positive. This finding is in accord with other surveys in the Caribbean. Sickle-cell anaemia is a common disease in Jamaica; during a 9-month period at least 40 cases were seen in the paediatric out-patients department at the University College Hospital, and at least one patient was an in-patient at any one time during almost the whole period. Analysis of several hundred paediatric patients showed that sickle-cell anaemia was the second most common cause of splenomegaly in Jamaican children. Almost all the examples of the disease seen in Jamaican children were quite typical and presented no diagnostic problem. There is in the opinion of the author a real difference between the incidence of sickle-cell anaemia in Jamaica and in Africa. In Ibadan, a large African city of half a million people in Western Nigeria, 23·7 per cent. were shown to be trait carriers [this *Bulletin*, 1952, v. 49, 1152], while despite this huge reservoir of heterozygotes, only 22 cases of sickle-cell anaemia were seen in an 18-month period. In contrast to this the much lower trait incidence in Jamaica of 5·7 per cent. and the commonness of the anaemic state are very striking. A map of the global distribution of the sickle-cell trait is a valuable part of the paper.

[There is added a graphic description of a migration theory by Lehmann and Cutbush (this *Bulletin*, 1952, v. 49, 1152), to which these authors can lay no claim. While they have shown that the sickle-cell trait exists at high frequency in the South Indian Veddoids, and while they suggested that the sickle-cell trait came from Asia to Africa, it is most unlikely that the South Indian Veddoids, nearly the most primitive people in the world, should have been able to cross the Indian Ocean. It is far more likely that any Veddoids who brought the trait to Africa came by the land route in the region of Aden (see Lehmann, this *Bulletin*, 1953, v. 50, 756).]

H. Lehmann

Schneider, Rose G. **Paper Electrophoresis of Hemoglobin as a Practical Method of differentiating various Types of Sickle Cell Disease and of Hemoglobin "C" Trait.** *Texas Reports on Biol. & Med.* 1953, v. 11, No. 2, 352–65, 4 figs. [12 refs.]

The erythrocytes of the sickle-cell anaemia patient have been found by Pauling *et al.* (*Science*, 1943, v. 110, 543) to contain almost 100 per cent. of sickle-cell haemoglobin which has a slightly higher isoelectric point than normal haemoglobin, and could therefore be separated from it by electrophoresis in the Tiselius apparatus. Erythrocytes from normal carriers of the sickle-cell haemoglobin contained a mixture of both normal and sickle-cell haemoglobin. Another abnormal haemoglobin, haemoglobin C, was described by Itano (*Proc. Nat. Acad. Sci.*, 1951, v. 37, 775): it had a still higher isoelectric point than sickle-cell haemoglobin. When present with sickle-cell haemoglobin, haemoglobin C gives rise to a mild anaemia—a modified sickle-cell anaemia; when present with normal haemoglobin no haemolytic anaemia is found.

As electrophoresis with a Tiselius apparatus is impractical for general routine investigations, Miss Schneider decided to separate the different haemoglobins by electrophoresis on filter paper by modifying Durrum's (*J. Amer. Chem. Soc.*, 1950, v. 72, 2943) apparatus which was designed for filter-paper electrophoresis of serum proteins. Red cells were lysed with ether and haemoglobin solutions of 2–5 per cent. prepared from them in phosphate, cacodylate or veronal buffers of 0·05 ionic strength. The most dependable results were obtained with veronal buffers at *p*H 8·6 to 9. The filter paper was Whatman No. 1. The current was passed through it while the apparatus was kept at a temperature of 6–10°C. in a refrigerator: 0·5–1·3 milliampères per cm. width of filter paper and 8–16 volt per cm. length were applied for 2–8 hours. After this the strips were dried over a hot plate to prevent movement of haemoglobin by capillary action due to uneven drying. For most purposes staining was not essential as the haemoglobin was still visible. It was not possible to standardize conditions from one run to another so that precisely the same migration patterns could be obtained repeatedly. Thus a sample of sickle-cell haemoglobin (or haemoglobin from a sickle-cell anaemia patient) and a normal haemoglobin had to be included with each group of unknowns. The paper shows in photographs how it was possible to differentiate between the various types of haemoglobin and how it was possible to discover, by using controls with known mixtures of sickle-cell anaemia and normal samples, as little as 10 per cent. of normal haemoglobin in combination with 90 per cent. of sickle-cell haemoglobin. *H. Lehmann*

VENOMS AND ANTIVENENES

Chatterjee, A. K. **Studies on Snake-Venoms. Part II. The Mechanism of Inhibition of the Cytochrome-Oxidase System caused by an Active Principle isolated from Cobra Venom.** *Ann. Biochem. & Exper. Med.* Calcutta. 1952, v. 12, No. 3, 79–92, 6 figs.

Bettini, S., Antonini, E. & Cantore, G. La terapia del morso di *Latrodectus 13-guttatus*, Rossi. Nota II—Cinque nuovi casi di latrodectismo trattati con gluconato di calcio endovena. [**Five Cases of** *Latrodectus* **Bite Treated with Calcium Gluconate Intravenously**] *Arch. Ital. Sci. Med. Trop. e Parassit.* 1953, Nov., v. 34, No. 11, 579–87.

The English summary appended to the paper is as follows:—

"The authors describe 5 new cases of latrodectismus treated with calcium gluconate intravenously. In all cases a considerable improvement of the symptomatology was noted shortly after the administration of the drug."

TOXOPLASMOSIS

Hall, E. G., Hay, J. D., Moss, P. D. & Ryan, M. M. P. **Congenital Toxoplasmosis in the Newborn.** *Arch. Dis. in Childhood.* 1953, Apr., v. 28, No. 138, 117–24, 12 figs. [18 refs.]

The 2 cases reported were encountered at one maternity clinic within a short period. Both infants showed signs of generalized toxoplasmosis at birth. One lived only a few minutes; the other survived several months and developed classical signs of the disease.

The mother of the first child gave no history of any illness suggestive of toxoplasmosis; there was marked hydramnios 2 months before delivery, and the delivery was by forceps. The placenta appeared normal but weighed 740 grammes; the infant weighed 2,730 grammes. There was a purpuric rash on the trunk and limbs and the liver was enlarged. There was slight jaundice. Hydrocephalus developed and increased and microphthalmia became evident. Multiple discrete foci of cerebral calcifications were seen by X-ray. Toxoplasms were not identified during life nor at an extensive post-mortem examination, but a complement-fixation test was positive at 1 in 1,024 titre.

The second child was born after a normal delivery; the mother had had no particular illness. The placenta weighed 1,200 grammes and the baby 2,170 grammes; the former was pale grey and friable, and the latter pale and oedematous and died 15 minutes after birth. The child was slightly jaundiced and had an extensive purpuric rash. There were slight calcifications in the region of the basal nuclei. The complement-fixation test in the mother was positive at a titre of 1 in 20, but the dye test was positive 1 in 256.

The main feature of the necropsy on the child was the petechial haemorrhages in many organs. The spleen and liver were enlarged. Toxoplasms were found in many organs and tissues including the brain, heart, muscle, lungs, liver, and bone-marrow, and also in the placenta. The pathological appearances were suggestive of acute haemorrhagic disease of the newborn.

A purpuric rash occurred in both cases. The platelet count was low in the first case, and in both the platelet precursors were scanty in a generally active bone-marrow. Both placentae were large, that in the second case markedly so, but in neither were there any specific histological lesions; the enlargement was apparently due to oedema. *L. E. Napier*

Woke, P. A., Jacobs, L., Jones, Frances E. & Melton, Marjorie L. **Experimental Results on possible Arthropod Transmission of Toxoplasmosis.** *J. Parasitology.* 1953, Oct., v. 39, No. 5, 523–32.

The channel through which a man becomes infected with *Toxoplasma* has not been identified. The authors carried out a number of experiments, described very clearly, to test the postulate that blood-sucking arthropods may be concerned in transmission.

Animals of many species were used as donors; they carried a virulent (and generally fatal) infection. Arthropods which had fed on them were inoculated into various susceptible mammals: attempts to transmit by bite were also made.

A number of arthropods, among them *Bdellonyssus*, *Cimex*, *Culex* and *Xenopsylla*, though used in numbers, failed to transmit and were not shown to harbour the infection. Certain organisms (*Rhodnius prolixus*, 2 species of *Triatoma* and *Rhipicephalus sanguineus*) retained the toxoplasm infection for considerable periods but did not transmit it.

Three hard ticks (*Dermacentor variabilis* and *andersoni*, *Amblyomma americanum*) and also *Pediculus humanus* could be shown by inoculation to maintain the infection. In a small proportion of cases these animals also transmitted by bite. The authors are cautious and regard their work as indicating lines on which an advance may be made. *P. A. Buxton*

DERMATOLOGY AND FUNGUS DISEASES

Nuñez Andrade, R. Tiña imbricada. [**Tinea imbricata**] *Medicina.* Mexico. 1953, Oct. 25, v. 33, No. 686, 473–9. [26 refs.]

This is a general account of tinea imbricata, quite satisfactory as such, but containing little, if anything, new. The author mentions 36 synonyms and sketches its history from the first known description of it in 1686 by Dampier on his voyage round the world, down to Kanawa and Nagai in 1917; next, the geographical distribution which is practically world-wide, and its epidemiology. It affects almost entirely adolescents and adults and is thought to be rare in children, but the authors met with a case in a girl of 3 years old in Mexico. In some of the South Pacific islands it is very common, one-third to three-fourths of the inhabitants being affected; in others only sporadic cases are seen. The symptoms, clinical forms and their evolution are next considered and the diagnosis between it and other dermatoses, pinta, pemphigus foliaceus, pityriasis rubra, ichthyosis, syphilides, etc. The causative fungus, *Trichophyton concentricum*, its synonyms, growth characters on dextrose Sabouraud medium and its treatment by fungicides are mentioned, more than a dozen in all. They all seem to be effectual, though relapse is common after apparent cure. The prognosis is good as regards life but, if untreated, the disease may persist indefinitely. Many proprietary drugs, in ointment or powder form, are mentioned and 5 prescriptions of fungicides in modern use are given.

H. Harold Scott

Clarke, P. R. R. **Mycetoma of the Testis.** *Lancet.* 1953, Dec. 26, 1341. A case in the Sudan.

Campins, H. & Scharyj, M. Cromoblastomicosis. Comentarios sobre 34 casos, con estudio clinico, histologico y micologico. [**Chromoblastomycosis. Commentaries on Thirty-Four Cases, with Clinical, Histological and Mycological Study**] *Gac. Méd. de Caracas.* 1953, Mar.–Apr., v. 61, Nos. 3/4, 127–51, 12 figs. [12 refs.] English summary.

Chromoblastomycosis was reported for the first time in Venezuela only in 1938, by O'Daly [*Rev. Policlinica Caracas*, 1938, No. 44, 2300], but numerous records since then have shown that the disease is not uncommon in certain parts of the country.

The present report reviews 34 cases, all in persons of mixed race, of whom 19 were men and 15 women. The ages ranged from 21 to 78, the average being in the middle period, and all were engaged in rural occupations. The lesions took the form of a simple raised plaque in many cases, but in others it assumed a more verrucose character or appeared as an ulcero-granulomatous mass spreading marginally and healing by cicatrization at the centre; secondary infection of this type of lesion was common and destructive ulceration on the face caused deformity. Extension took place through the superficial lymphatics with the formation of subcutaneous nodules which eventually invaded the epidermis. The duration of the disease was from 7 months in one case to 40 years in another; the average being 9 years for the whole 34 cases. The lesions occurred on the face or upper extremity in 22 cases and on the buttock or lower extremity in 12. They were distributed as follows: on the face in 3, arm and forearm 3, elbow 2, forearm 5, forearm and hand 1, hand 8, buttock 2, thigh and leg 1, leg 4, foot and leg 1, foot 4.

The diagnosis was based on the microscopic examination of biopsy

material in all 34 cases and confirmed by culture of the causative fungus in 30. Four of the cultures were identified as *Phialophora pedrosoi* and 2 as *Phialophora compactum*; the remaining 24 still await specific identification.

The geographical distribution of the cases is of particular interest. Twenty-nine occurred in the state of Lara in the following districts: Torres 17, Giménez 6, Urdaneta 3, Iribarren 2, Palavicini 1. Only 2 cases occurred in the state of Yaracuy, in the districts of Sucre and Yaritagua, and 1 case each in the states of Barinas, Portuguesa and Falcón. In the state of Lara the disease was associated chiefly with arid areas with scanty rainfall and much xerophytic vegetation, including spinous plants capable of causing wounds which might be associated with the infection. *J. T. Duncan*

MARTIN, D. S. **Serologic Studies on North American Blastomycosis. Studies with Soluble Antigens from Untreated and Sonic-Treated Yeast-Phase Cells of** *Blastomyces dermatitidis*. *J. Immunology*. 1953, Oct., v. 71, No. 4, 192–201, 1 fig. [24 refs.]

A serological test for the diagnosis of blastomycosis (Gilchrist's disease), based on complement fixation in the presence of the intact yeast phase cells of *Blastomyces dermatitidis* as antigen, was devised by MARTIN [this *Bulletin*, 1936, v. 33, 473]. This test was also useful in prognosis; a high titre of the complement-fixing antibody, especially in the absence of dermal sensitivity to the fungus, indicating a severe or progressive infection and an unfavourable outlook.

The objects of the present study were to obtain from the yeast phase of *B. dermatitidis* a soluble antigen suitable for diagnostic tests with human serum; to determine whether such an antigen belonged to the protein or the carbohydrate fraction of the fungus, and to find if different antibodies were devoloped in man in response to the protein and polysaccharide antigens.

Two antigenic substances were obtained from the yeast phase cells; the first, of polysaccharide nature, diffused off the surface of the untreated cells into the saline suspending fluid which, after centrifugation, could be used as an antigen; the second, of protein nature with a small amount of polysaccharide, was obtained by subjecting a suspension in saline, of the washed cells, to sonic oscillation at about 9,000 oscillations per second for 15 minutes.

The polysaccharide antigen could be precipitated from solution by concentrating the fluid and adding isopropyl alcohol to give increasing levels up to 73 per cent. The gummy deposit formed could be collected by centrifugation and redissolved for use as antigen. The polysaccharide antigen gave a positive result in complement-fixation tests with *Blastomyces* antibody in rabbit serum but not with that in human serum. In this respect it resembled the polysaccharide antigen of some of the pneumococci. The precipitin reaction with human *Blastomyces* antibody was demonstrated, but the tests were restricted by lack of sufficiently clear samples of serum. As an alternative, haemagglutination was done with sheep's red blood cells sensitized with the *Blastomyces* polysaccharide antigen [see also NORDEN, this *Bulletin*, 1949, v. 46, 779]. These tests, as far as they were carried, showed the presence in human serum of an antibody for the polysaccharide antigen. Attempts to immunize mice by intraperitoneal injection of small doses of the polysaccharide (0·5 μgm.) gave promising results; a larger immunizing dose tended to paralyse the response.

The antigen of protein nature, obtained by sonic oscillation of thick suspensions of the yeast phase cells, gave complement fixation in combination with the *Blastomyces* antibody in 49 (71 per cent.) out of 69 sera from proved cases of blastomycosis; the test gave negative results with the remaining 20 sera (29 per cent.). Marked cross reactions were shown between the sonic extracted antigens of *Blastomyces* and *Histoplasma* and human sera from the corresponding diseases. The *Blastomyces* antigen usually reacted with blastomycosis serum at a titre at least as high, and often a little higher, than that at which the corresponding *Histoplasma* antigen reacted, but 7 sera from cases of proved blastomycosis, which did not react with the *Blastomyces* antigen, reacted well with the *Histoplasma* antigen; the possibility of coincident or previous histoplasmosis in these 7 cases had not, however, been excluded.

Dermal sensitivity tests with both protein and polysaccharide antigens of *B. dermatitidis* and *H. capsulatum*, made on guineapigs infected with either of these fungi, showed, in the case of tests with the protein antigens of the two fungi, complete cross-sensitivity, the animals reacting strongly to tests with both antigens. Tests with the polysaccharide antigens, however, gave almost entirely specific results, only 1 animal out of 12 sensitized with *H. capsulatum* reacting strongly to the *Blastomyces* polysaccharide.

As the complement-fixing antibody titre rises with the progress of the disease, it may be concluded that the anti-protein antibody which is responsible for the reaction has no significant effect on the course of the disease and it is, in fact, a response to the greater outpouring of the fungal protein antigen. On the other hand, the antibodies, demonstrable by the precipitation or haemagglutination tests, which are formed in response to the polysaccharide antigen are of greater significance in the development of resistance to the infection.

The important observations of Smith *et al.* [this *Bulletin*, 1951, v. 48, 73] on the significance of the complement-fixation and the precipitin reactions on the prognosis in cases of coccidioidomycosis, are borne out in the results of the present study if it be assumed that these two reactions are associated with the protein and the polysaccharide antigens respectively.

The early decline of the precipitating antibody titre in some systemic mycoses, with the progressive increase of the titre of complement-fixing antibody, may be an indication of failure of the specific immunity response. However, as an alternative, the present author postulates the occlusion of the anti-polysaccharide antibody (precipitin) by an excess of circulating polysaccharide antigen, and he offers convincing evidence from two cases in which the injection of small amounts of hyperimmune serum caused dramatic clinical improvement [Hiatt and Martin, *Bulletin of Hygiene*, 1946, v. 21, 437; Martin and Jones, *Surgery*, 1941, v. 10, 939].

J. T. Duncan

Camphyn, R. Résultats d'un test à la coccidioïdine. La coccidioïdomycose existe-t-elle au Congo? [**Results of a Test with Coccidioidin. Does Coccidioidomycosis exist in the Congo?**] *Ann. Soc. Belge de Méd. Trop.* 1953, Aug. 31, v. 33, No. 4, 341–5.

In a recent paper on the use of the coccidioidin skin test in the Belgian Congo, Martin [this *Bulletin*, 1954, v. 51, 109] reported a reactor rate of 3·4 per cent. from tests on 1,701 persons.

The present report deals with a similar survey in which the coccidioidin, obtained from the Cutter Laboratory, Berkeley, California, was used at a dilution of 1 in 100. The tests, conducted during May and June 1952 and

May 1953, revealed 1 reactor in a group of 183 schoolgirls aged from 5 to 19 years, 5 reactors (3 per cent.) in a group of 162 prisoners aged more than 20 years, and 6 reactors (2·92 per cent.) in a group of 205 prisoners aged from 20 to 40 years; these 6 reactors were also sensitive to tuberculin and in 2 of them there was radiological evidence of pulmonary disease. Coccidioidin tests on 34 patients with tuberculosis showed 4 reactors (11·70 per cent.).

These results, which show a coccidioidin test reactor rate of approximately 3 per cent. among adults in the region of Kasaï, are in harmony with those reported by Martin. The possibility of cross sensitivity to coccidioidin in persons dominantly sensitive to histoplasmin is admitted by the author, but control histoplasmin tests were not performed.

It is considered probable, although not yet proved, that coccidioidomycosis exists in Kasaï. No account is given of the topography of this region.

J. T. Duncan

HEAT STROKE AND ALLIED CONDITIONS

Dordick, I. L. **Climate and Work in Australian New Guinea.** *Acta Tropica.* Basle. 1953, v. 10, No. 3, 233–50, 3 figs. [15 refs.]

Economic and social progress within any country are attainable only in the framework of the environment and the limits of its modifiability. New Guinea is a land of extensive mountain ranges, swamps and dense forests and, with the tropical climate, this has led to lack of colonization by Europeans, the isolation and primitive state of the native population and to slow economic development and cultural penetration by administering authorities. Climatic conditions as they affect the physiological tolerance and the comfort of the inhabitants, at rest and work, are evaluated in this review.

The climate on the plain is tropical and humid, but on the central plateau at heights about 5,000 ft. above sea level it is almost temperate. On the plain the mean annual temperature varies between 77°F. and 82°F. and the humidity between 20 and 23 mm. Hg. vapour pressure. In the higher regions the mean annual temperature reaches only 55°F. In assessing the compatibility of the climate with normal physiological functioning and productive capacity the limits of tolerance established experimentally for subjects at rest and at work under similar hot humid conditions are examined. The Committee of Industrial Ventilation of the American Public Health Association find these limits for healthy Europeans dressed in warm clothes and performing physical tasks of 240 kgm. cal./hour and other sedentary activities demanding less effort, to be 80 and 85°F. effective temperature respectively (air velocity 20 ft./min.).

Effective temperatures (ET) on the plain lie between 74 and 79°F. These limits would naturally be raised when fully acclimatized persons of more leisurely habit and wearing very light clothes are considered. Limiting atmospheric conditions for performance of specialized mental tasks (87°F. to 97°F. ET) are well above the effective temperatures on the plains.

The climate of Australian New Guinea should not affect the efficient performance of severe physical or mental activities by Europeans but as occasionally the limits of atmospheric tolerance might be exceeded, man must adapt himself and his habits to combat the climate.

The tolerance of the native population to humid heat on the basis of racial acclimatization, adaptation and natural selection, would be greater than the European but, as they acquire European customs and standards of living and productivity, their tolerance might be reduced. *Barbara Tredre*

PARASITOLOGY: GENERAL

Tigertt, W. D., Hunter, G. W. & Ritchie, L. S. **Parasitological Studies in the Far East. I. Methods and Review of Japanese Literature.** *Japanese J. Med. Sci. & Biol.* 1952, Oct., v. 5, No. 5, 357–85, 9 figs. [45 refs.]

"In this introductory paper the aims, methods and general background are presented for a series of parasitologic surveys in Japan, Okinawa and Korea. Approximately 30,000 persons selected at random in about 140 communities have been examined. Separate reports of findings will be made for 12 more or less distinct geographical areas, to be followed by summaries and correlation of data."

[This is the first part of the Series of which Parts II to VI and VIII and IX in the *Japanese J. Med. Sci. and Biol.*, and Parts VII, XI and XIV in mimeographed form have appeared since 1950 (this *Bulletin*, 1952, v. 49, 523, 633, 881, 1050; 1953, v. 50, 525). It is not clear why Part I should have been published later or why intervening Parts do not yet appear to have been published.]

Sapero, J. J. & Lawless, D. K. **The "MIF" Stain-Preservation Technic for the Identification of Intestinal Protozoa.** *Amer. J. Trop. Med. & Hyg.* 1953, July, v. 2, No. 4, 613–19.

In a previous paper [this *Bulletin*, 1952, v. 49, 727] a new method for simple and rapid staining of protozoa in faecal preparations with merthiolate-iodine-formaldehyde (MIF) was described. This stain (the composition of which was already given) is used for direct identification of the intestinal parasites in faecal smears. In the present paper an account is given of the use of a modification of the MIF solution as a preservative for fixing and staining entire faecal specimens, in which protozoa—as well as helminth eggs—retain their normal structure and can be identified several months after collection with the same accuracy as in freshly stained faecal smears.

The composition of the modified MIF solution is as follows: (a) 480 cc. stock solution (250 cc. aq. dest., 200 cc. of 1 : 1,000 tincture merthiolate, 25 cc. formaldehyde, 5 cc. glycerin); (b) 5 per cent. Lugol's iodine.

A collection unit consists of 2 stoppered Kahn tubes, one containing 2·35 cc. stock solution, the other 0·15 cc. Lugol's iodine. When a stool is collected, these 2 solutions are united in one tube, and a portion of faeces about twice the volume of a pea (about 0·25 gm.) is teased up in the preservative. For larger amounts of faeces the volume of fluids is increased proportionally. The tube is then stoppered, labelled and kept until required for examination. For examination, a drop of mixed supernatant fluid and faeces is removed from the top of the sediment with a pipette and placed on a slide, after which a coverslip is applied to it.

The MIF compares favourably with other laboratory diagnostic methods (saline, iodine and iron haematoxylin preparations). The main advantage of the MIF technique over other methods is due to the preservation of the intestinal parasites for long periods of time, which enables one to postpone examination until convenient, or to post specimens from the field or from inadequately equipped and staffed laboratories to those specializing in the diagnosis of these parasites. In the words of the authors, this staining and preserving solution " permits busy clinical laboratories to achieve highly accurate stool diagnoses with far less time and technical complexity than is ordinarily required by methods presently in use ". *C. A. Hoare*

ENTOMOLOGY AND INSECTICIDES: GENERAL

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Meyer, K. F. **Vectors and Reservoirs of Virus Diseases.** *Amer. J. Trop. Med. & Hyg.* 1953, Sept., v. 2, No. 5, 757–70. [31 refs.]

This paper, read on the occasion of the opening of new laboratories at the University of California, is a presentation of various aspects of arthropods in relation to the transmission and persistence of virus diseases in animals and plants. It is a highly selective review of literature on the subject with the additional interest of the author's comments and contemplations on the problems which the review exposes.

After discussing the criteria to be satisfied before accepting an arthropod as a vector of a virus, the paper considers such subjects as extrinsic incubation periods, the multiplication of virus in arthropods, and ecological problems in the epidemiology of virus diseases in which infection of man is a side chain to complex inter-relationships between animals and their vectors of the virus. Particular emphasis is laid on the fact that the arthropod, although referred to customarily as the intermediate host, plays an important rôle as a reservoir of virus. This is particularly so in virus infections of man and animals in which persistence of the virus in the vertebrate in a state transferable to another is extremely brief. Transovarial inheritance of virus in ticks enhances their function as reservoirs. Plants, however, usually serve well as chronic virus carriers and the significance of the arthropod as a reservoir is less important. Much of the matter discussed is drawn from research on yellow fever, and tick-borne and mosquito-borne encephalitis. An interesting general problem is the complete tolerance of vectors to the highly virulent viruses they transmit to animals and plants.

The article concludes by drawing attention to the isolation of new viruses, particularly in the tropics, in recent years. *D. S. Bertram*

Weitz, B. & Buxton, P. A. **The Rate of Digestion of Blood Meals of Various Haematophagous Arthropods as determined by the Precipitin Test.** *Bull. Entom. Res.* 1953, Sept., v. 44, Pt. 3, 445–50.

The paper first discusses briefly the factors likely to influence the amount of blood available in a blood sucking arthropod for use in precipitin tests

and notes that environmental conditions after a meal—for example, temperature—may alter the rate of digestion of a meal and the amount of serum protein available for identification after a given lapse of time. Work was therefore done on a number of well-known blood-sucking arthropods to determine their rate of digestion of blood meals under known laboratory conditions.

The arthropods used were: *Aëdes aegypti, Anopheles maculipennis atroparvus, A. aquasalis, Culex molestus, Culicoides nubeculosus, Cimex lectularius, Glossina morsitans, G. swynnertoni, Ornithodorus moubata,* and *Bdellonyssus bacoti.*

Gut smears of *G. swynnertoni* were of field-caught flies for which it was known that they must have fed on some mammal about 2–3 days before capture. *A. aquasalis* were wild mosquitos which had fed on a tethered ox, smears being made at intervals after their engorgement. All other species were laboratory strains fed on man for these experiments, or occasionally other animals and, in the case of *O. moubata,* only on rhesus monkey, pig, or fowl. This material was kept after the blood-meal at 25°C. and 80 per cent. relative humidity, samples being smeared after the meal at intervals up to several months (bugs and ticks) or 5 days (other arthropods).

The shortest period of digestion (about 1 day) occurred with the mite *B. bacoti* and the longest with the tick *O. moubata,* which was still positive for monkey, pig and fowl for, respectively, 65, 180 and 210 days after the blood meal. A few *C. lectularius* were positive after a month.

The mosquitoes and midge usually gave positive results up to 16 hours and a high proportion of them up to 24 hours. But few of the laboratory-fed species yielded positive results 3 days after the meal. In laboratory-fed *G. morsitans* blood of man, ox, sheep or goat was identified in practically all specimens after 3 days but only 28 per cent. of wild-caught *G. swynnertoni* gave a positive result after a similar period of digestion in the field. There is confirmatory evidence from field observations in Africa that captive flies digest more slowly than flies free in natural conditions.

The conditions of the precipitin tests and readings are defined.

D. S. Bertram

Worth, C. B. **Construction and Use of a Simplified Window Trap for Insects.** *Mosquito News.* 1953, Sept., v. 13, No. 3, 204–6, 1 fig.

Complete instructions and dimensions are given in this paper for making and using this window trap which was evolved during studies on the nocturnal activities of anopheline mosquitoes in Mysore State, India. It is claimed that it is sturdy, cheap, quickly made, easily operated, conveniently transported and adaptable to any window space or other aperture of houses and cattle sheds.

Its essential parts are a plywood board with a central hole to which is fixed a celluloid cone (having a base of about a foot in diameter and a height of about 2 feet) and a Barraud's cage. The board is fixed across the opening in the wall and all irregularities are sealed off with paper or other litter. If the opening is large additional pieces of board complete the blockage. The apex of the cone is inserted in the sleeve of the Barraud's cage which is suspended from the outside eaves or it may rest on a table or other platform.

It is difficult for the leaving mosquitoes to rest on the smooth celluloid and their entry into the cage is prompt. Another advantage is that the Barraud's cages can be changed at any desired intervals. *H. S. Leeson*

Holstein, M. Etudes sur l'anophélisme en A.O.F.—2. Présence d'*Anopheles wellcomei* Theo. 1904. [**Anophelines in French West Africa. 2.** *A. wellcomei*] *Ann. Parasit. Humaine et Comparée.* 1953, v. 28, No. 4, 328–30.

Anopheles wellcomei is reported from French Sudan for the first time. Altogether 1 male and 18 females were collected during 1952 and 1953 among other species; 8 were taken indoors and 10 outside. This brings to 12 the number of anophelines recorded from this part of French West Africa. *H. S. Leeson*

Van Hell, J. C. **A New Anopheline Larva in Netherlands New Guinea:** *Anopheles (Myzomyia) cristatus? Documenta Med. Geograph. et Trop.* Amsterdam. 1953, Sept., v. 5, No. 3, 255/60, 1 fig. [17 refs.]

Castro, G. M. de O. Estudo ecológico de mosquitos no Vale do Jequitaí. (Nota preliminar.) [**Ecological Studies of Mosquitoes of Jequitai Valley, Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1953, Jan., v. 5, No. 1, 75–83, 1 fig. English summary.

Halcrow, J. G. **Observations on the Anal Papillae of** *Culex (culex) fatigans* **Wiedemann.** [Correspondence.] *Nature.* 1953, Dec. 19, v. 172, 1156.

Although the length and shape of the anal papillae of mosquito larvae have not been regarded as critical specific factors, their variation may be so great as to cause confusion in immediate identification. Kettle has shown that the length of the anal papillae in *Anopheles sergenti* is dependent on the salinity of the habitat and that small changes in this may produce large differences in the length of the papillae [this *Bulletin*, 1948, v. 45, 967].

The present author found a similar phenomenon in the case of *Culex fatigans* in Mauritius. Fourth stage larvae of *C. fatigans* breeding in a tin can containing foul-smelling water and decayed leaves had very long, lanceolate anal papillae, white in colour. " A more than cursory " examination was needed to identify the larvae. Comparisons were therefore made with larvae breeding in a small concrete tank, with the following results:

Habitat	*Water*	*pH*	*Salinity (sod. chloride gm./1*	*Average length of papillae*	*Siphonal index*
Tin can ...	Dark brown, foul ...	8·5	0·40	8·0 mm.	3·8–4·2
Concrete tank	Clear ...	8·0	1·04	3·8 mm.	3·5–4·0

The striking increase in length of the anal papillae may be due directly to the low concentration of halides in the larval habitat, but it is pointed out that life in a small tin can may invoke other responses which would result in such elongation. *H. J. O'D. Burke-Gaffney*

Rachou, R. G. & Lima, M. M. Contribuição ao conhecimento dos hábitos domiciliários do *Culex fatigans* no sul do Brasil. [**Study of the Domiciliary Habits of** *Culex fatigans* **in Southern Brazil**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1953, Jan., v. 5, No. 1, 29–34. English summary (8 lines).

About 4,500 *Culex fatigans* were collected from houses in Florianópolis, Brazil, and their distribution indoors is discussed. About a quarter of them

occurred resting in bedrooms, rather less than a half in bathrooms and lavatories and the remainder in kitchens and dining rooms. Most had fed. About 60 per cent. rested on the ceiling and upper reaches of the walls and the remainder on the lower walls, curtains and furniture. Application of residual insecticides to all these surfaces is recommended for the control of this local vector of bancroftian filariasis. Tables provide both the numerical and the percentage data of the catches. *D. S. Bertram*

Ricciardi, I., Paulini, E., Nascimento, L. P. & de Arbeu, H. Experiências visando avaliar o poder mosquitocida dos vapôres de Hexaclorociclohexano. [**Study of the Insecticidal Action of BHC Vapour on Mosquitoes**] *Rev. Brasileira Malariologia.* Rio de Janeiro. 1953, Jan., v. 5, No. 1, 109–14. English summary.

Three huts were constructed, measuring 2 × 2 × 2 metres, each with a door and one window, the latter being fitted with a gauze mosquito trap. The walls were of mud, lined internally with plaster. Two of the houses were sprayed with BHC emulsion to give a dosage of about 225 mgm. gamma isomer [? per sq. m.]. One of these was used to investigate the contact plus vapour action of BHC and the other was to test vapour action alone; this latter had the walls covered with gauze, held 2 cm. from the surface. The third hut was kept as an untreated control.

The insecticidal effects were judged by action on *Culex fatigans* females reared in a naturalistic insectary. Batches of 500 or 1,000 mosquitoes were released inside the huts at different intervals after treatment. Most of the insects were recovered after 24 hours in the control hut, though up to 50 per cent. were lost in the treated ones. The mortality of *C. fatigans* on the floor and in the trap amounted to 60 to 70 per cent. (of the recovered mosquitoes) for 30 days and 30 to 40 per cent. at 60 days after treatment. There was little difference in the two treated huts and control mortality was negligible.

Clearly, BHC vapour was having a lethal effect, and this was further demonstrated by tests in which the insects were confined in cages 1 metre from the walls, inside and outside the huts. Mortality was again high up to 30 days but fell off considerably at 60 and 90 days. Further tests showed that the lethal effect was greater and more prolonged in houses kept closed than those remaining open. *J. R. Busvine*

See also p. 298, Hamon, Apparition à la Réunion d'une résistance au DDT chez *Culex fatigans* Wiedemann, principal vecteur de la filariose à *Wuchereria bancrofti* dans l'île. [**The Appearance in Reunion of Resistance to DDT by** *Culex fatigans*, **the Principal Vector of** *Wuchereria bancrofti*, **in the Island**]

Mattingly, P. F. **The Sub-Genus** *Stegomyia* **(Diptera: Culicidae) in the Ethiopian Region. II. Distribution of Species confined to the East and South African Sub-Region.** *Bull. Brit. Mus. (Nat. Hist.)* Entom. Ser. 1953, v. 3, No. 1, 3–65, 15 figs. [Numerous refs.]

Aëdes mosquitoes of the sub-genus *Stegomyia* of the West African sub-region were dealt with in Part I of this series [this *Bulletin*, 1953, v. 50, 67]. The present paper follows the pattern of Part I and is concerned with the species of *Stegomyia* which occur in East and South Africa and which have not been recorded from the West African sub-region; the number of these species is greater, though less is known about them.

The author has attempted to bring together all the available data about distribution, particularly those relating to rainfall and altitude, as a preliminary to a taxonomic study which will form the subject of further papers in this series. Certain facts are discussed which have a bearing on the relationships between the Ethiopian *Stegomyia* fauna and that of the Palaearctic region.

Notes are given, species by species, on taxonomy and on distribution records; a new species (*Aëdes* (*Stegomyia*) *vinsoni*) is described from a single female, found in Mauritius, the male and early stages being as yet unknown. The list of localities with their topographical details is restricted to information not included in Part I and a similar list is given in an appendix for the distribution of the pale forms of *Aëdes aegypti* in the Ethiopian region. Keys for identification are omitted but there are a few alterations which have to be made to those published in the earlier paper.

As before, zoogeography is discussed in relation to rainfall and altitude but owing to the paucity of East and South African records the subject is not dealt with as fully as for the West African species. It is known, however, that there are no less than 27 species entirely confined to this sub-region in addition to any others which may remain to be discovered. One of the mysteries is the absence of any records of the occurrence of *Aëdes albopictus* on the mainland. Over most of its range this species is associated with heavy rainfall, but in parts of India and China it encounters rainfalls at least as low as those of most of the coastal areas of East Africa. The author suggests that the most likely places for the further spread of *Aëdes albopictus* are Zanzibar and its adjacent islands and the country northwards from Tanga.

Regarding the general subjects which were discussed in Part I, all that is attempted here is a presentation of the available data. Lists are given of known breeding places and of those species which are known to, or are likely to, bite man; those not on record as attacking man are: *Aëdes heischi*, *langata*, *calceatus*, *denderensis* and *schwetzi*. There is little knowledge of seasonal behaviour and of vertical distribution; the only species recorded as being definitely acrodendrophilic are *Aëdes deboeri*, *ruwenzori*, *bambusae* and *angustus*, and though *subargenteus* has been taken biting in the canopy, it is not known whether it is more abundant there than on the ground. Forms which appear to prefer the ground are *bambusae kenyae* and *soleatus*.

Further information is given, in an appendix, on West African species and on rainfall in certain parts of the Sudan, Abyssinia, Kenya, Uganda and the Belgian Congo. References to literature are confined to works which were not included in the first paper. As with Part I, this paper is well provided with maps. *H. S. Leeson*

Travis, B. V. **Laboratory Studies on the Hatching of Marsh-Mosquito Eggs.** *Mosquito News.* 1953, Sept., v. 13, No. 3, 190–98. [13 refs.]

"Laboratory studies were undertaken to develop a method of flooding that would insure a complete hatch of mosquito eggs on soil samples collected from salt marshes for population studies.

"When eggs of *Aëdes taeniorhynchus* (Wied.), *sollicitans* (Wlkr.), and *Psorophora confinnis* (L.-Arr.) were flooded repeatedly with untreated water . . . they continued to hatch through the fifth, third and seventh floodings, respectively. The greatest percentage of *taeniorhynchus* and *confinnis* eggs hatched with the third flooding and of *sollicitans* with the first.

"The addition of asparagine-sodium biphosphate solutions or infusions made with leaves of marsh plants or soil to rain, tap, distilled or sea water caused nearly all the *Aëdes* eggs to hatch with the first flooding. Fewer eggs hatched in the treated sea water than in the other waters.

"Nearly all the *taeniorhynchus* eggs placed on marsh-soil samples hatched with the first flooding . . . of rain or sea water, with or without asparagine.

". . . soil samples collected from salt marshes and flooded with rain water . . . showed that more than 90 per cent of the *Aëdes* eggs hatched with one flooding. . . .

"Eggs of *taeniorhynchus* and *sollicitans* submerged in rain, tap, or distilled water within 24 hours after being laid hatched without an interval of drying. Some hatching occurred between the 4th to 8th days and thereafter up to the 210th day when fresh water was added or when the eggs were stirred in the containers. Eggs of *sollicitans* hatched in a like manner in sea water, but no *taeniorhynchus* eggs hatched when kept in sea water.

"When the eggs of the three test species were kept wet and dry for a variable number of days, many of them were viable after being kept wet for only 2 days, but 3 days seemed necessary for the embryos to properly mature. Eggs of *sollicitans* were less damaged by drying within the first 3 days than those of *taeniorhynchus*, but *confinnis* eggs were most resistant to damage from drying. The same relationship held for eggs stored in air-dry glass vials."

Twinn, C. R. **Mosquitoes and their Control in Prince Edward Island.** *Mosquito News.* 1953, Sept., v. 13, No. 3, 185–90, 4 figs.

Prince Edward Island is situated in the Gulf of St. Lawrence, Canada. It has an area of 2,184 square miles, a population of 100,000, a mean monthly temperature of 15·5°F. in February and 78·8°F. in August and an annual precipitation of 43 inches of which 11·6 inches is in the form of snow. Mosquitoes are periodically a nuisance from June to September.

An investigation into the mosquito nuisance was made in the National Park which runs along the north shore for 25 miles and has an area of 7 square miles. As a result of this survey the number of mosquito species now recorded from the island is 15 (13 of *Aëdes* and 1 each of *Culiseta* and *Mansonia*). The 2 tables give lists of the species, the larval habitats, the species associations, and the 4 photographs show the types of breeding places.

Species likely to be troublesome in large numbers throughout the season are *Aëdes cantator*, the brown salt marsh mosquito, *Aëdes sollicitans*, the white banded salt marsh mosquito, and *Aëdes vexans*, the rainpool mosquito. Notes are given on the habits of these and the other species collected. All the *Aëdes* species attack man but *Culiseta morsitans* does not.

Recommendations were made that DDT in fuel oil should be applied to breeding places at the rate of $\frac{1}{4}$ lb. DDT per acre; that woodland species need 1 treatment in the spring; that the salt marsh and rainpool species need several treatments as necessary; that DDT aerosol should be used when required and that permanent measures (draining, filling, etc.) should also be included. *H. S. Leeson*

Smith, C. N. & Gilbert, I. H. **Effectiveness against Mosquitoes of General-Purpose Repellent Mixtures for Application to Clothing.** *J. Econom. Entom.* 1953, Aug., v. 46, No. 4, 671–4.

The paper reports on experiments to test the repellent efficiency of 15 modifications of the standard repellent (M-1960) used for the impregnation

of clothing of American military personnel to give protection against bites of mosquitoes, fleas, ticks and mites. (M-1960, which consists of equal parts of benzyl benzoate, *N*-butylacetanilide, and 2-butyl-2-ethyl-1,3-propanediol with 10 per cent. Tween 80, has not yet been declared entirely suitable for civilian use on account of some uncertainty about its toxicological features.)

So far the new mixtures have been tested against *Aëdes aegypti*, *Aëdes taeniorhynchus* and *Anopheles quadrimaculatus* and tests with fleas, mites and ticks are in progress.

The new substances which were substituted for one or more of the 3 active constituents of M-1960 were selected on account of their established effectiveness against one or other of several arthropods. They are:— *N*-isopropyl-acetanilide, *N*-propylacetanilide and dibutyl adipate for ticks; *N*-butyl-4-cyclohexane-1,2-dicarboximide for mosquitoes, hendecenoic (undecylenic) acid for mosquitoes and fleas; and lindane for chiggers and lice. The new mixtures have serial numbers between 2006 and 2066.

The new mixtures were impregnated on cotton stockings at dosages of 3·3 to 3·6 gm. per square foot. Protection against the bites of mosquitoes was assessed after each 8-hour period of wear and various periods of hanging on lines in the laboratory.

Tables summarize the results and show the constituents of each numbered mixture. In general, mixtures which included the 2 new compounds effective in repelling mosquitoes usually gave better protection against *Aëdes aegypti* than M-1960. The inclusion of the hendecenoic acid gave consistently better results. Mixtures of these 2 new compounds with *N*-propylacetanilide and 1 per cent. of lindane extended the period of protection to over 44 days against 3 days for M-1960 under conditions of particularly vicious biting activity by *Aëdes aegypti*. In other tests, M-1960 had usually given about 20 days of protection. The effective mixtures containing lindane were M-2065 and M-2066. All these results were obtained against *Aëdes aegypti*: with *A. quadrimaculatus* none of the new mixtures tested (these did not include M-2065 and M-2066) gave better protection than M-1960 and, in field tests with *Aëdes taeniorhynchus*, the results (including tests of M-2065 and M-2066) were not greatly different from those with M-1960 and, usually, less effective. *D. S. Bertram*

Rajindar Pal & Sharma, M. I. D. **Microbioassay Method for D.D.T.** *Indian J. Malariology*. 1952, Sept., v. 6, No. 3, 275–80, 1 chart. [10 refs.]

During malaria control programmes it is frequently necessary to determine the amount of DDT present on sprayed surfaces. The chemical method of the estimation of DDT devised by Alessandrini, although useful under field conditions in many instances, gives erratic results when scrapings are obtained from sprayed walls which have been contaminated with organic material as is often the case in India.

An experiment was devised to examine the scope and limitations of a bioassay method of DDT determination. *Aëdes aegypti* larvae were found to be more satisfactory for such tests than either *C. fatigans* or *Anopheles stephensi* larvae. Early 4th instar larvae were exposed to concentrations of DDT varying from 0·0025 mgm. to 0·015 mgm. DDT per 100 cc. of water. The mortality of larvae after 24 hours increased progressively in dilutions of DDT from 0·0025 mgm. to 0·01 mgm. per 100 cc. of water, but at concentrations of 0·01 mgm. to 0·015 mgm. DDT per 100 cc. of water there was no appreciable difference in mortality.

The accuracy of the bioassay technique was assessed, and also compared with the Alessandrini method of DDT estimation, by making extracts from wall scrapings in which known quantities of DDT had been mixed. These tests showed that by the bioassay technique the estimation of DDT was in excess of the actual amount of DDT present, and by the Alessandrini method the estimation of DDT was less than the actual amount present—as is shown in the following example:—

DDT actually present (mgm.)	DDT estimated by bioassay (mgm.)	DDT estimated by Alessandrini method (mgm.)
0·5	0·64	0·18
1·0	1·84	0·48
0·25	0·48	0·18

The bioassay method of estimating DDT is not satisfactory if precise quantitative data are required, but may be used as a routine method for the determination of DDT in the field. *C. M. Harrison*

Tálice, R. V. Estudios sobre la biología de las moscas domésticas. Influencia de diversos factores sobre la capture mediante trampas con cebo de puesta. [**Studies on the Biology of House-flies. Influence of Different Factors on Catches in Baited Traps**] *An. Facul. de Med. Montevideo.* 1952, Sept.–Dec., v. 37, Nos. 9/12, 423–33, 4 figs. English summary.

The trap used to catch flies in this work consisted of a box with a solid floor and tapering top, only the sides being of gauze panels. These included the usual type of inwardly directed cone. The bait was confined to an inner chamber of gauze so that flies did not oviposit in the medium. After a description of the trap, which is fully illustrated, an account is given of its efficiency under different conditions. Fish bait was most attractive to flies, but manures gave the best catches of *Musca* spp. A blue trap was least effective, and grey and white were most attractive; other colours tried were green, yellow and red. Numerous tables give results for these and other factors which seemed to influence the efficiency of the trap.

D. S. Bertram

Rajindar Pal, Sharma, M. I. D. & Krishnamurthy, B. S. **Studies on the Development of Resistant Strains of House-Flies and Mosquitoes.** *Indian J. Malariology.* 1952, Sept., v. 6, No. 3, 303–16, 2 charts. [53 refs.]

The authors survey briefly the present state of knowledge of resistance to insecticides in house-flies and mosquitoes.

There has been regular spraying with DDT for 3 to 6 months every year since 1945 in the Delhi district of India, yet there has been no evidence of resistance to DDT in house-flies in that area. An attempt was made to select a strain of house-flies (*M. nebulo*) for resistance to DDT. The resistance to kill was increased 13 to 39 times that of a normal strain, with considerable variations in different generations, whereas the resistance to knock-down was only increased to twice that of a normal strain. When not exposed to DDT this strain rapidly lost resistance.

There was no indication of resistance to DDT in *Anopheles culicifacies* collected from rural areas in Delhi which had been sprayed with DDT since 1945. It was also found impossible to obtain a resistant strain of *Anopheles*

stephensi by exposing adults to 12·5 mgm. DDT per sq. ft. Exposure of these mosquitoes to this DDT deposit for 10 minutes inhibited the development of eggs and after a longer exposure they were unable to take a blood meal. Fully fed mosquitoes exposed for 5 minutes failed to lay eggs, but after a similar exposure gravid females laid viable eggs.

Culex fatigans collected from an area regularly sprayed with DDT during 6 years proved to be slightly resistant to this insecticide when compared in laboratory tests with mosquitoes of the same species collected from an untreated area. When exposed to 300 mgm. DDT per sq. ft. for 5 hours, 100 per cent. of the *Culex fatigans* from unsprayed villages were knocked-down, whereas only 66 per cent. females and 79 per cent. males of the stock collected from treated villages were knocked-down. Similarly after exposure for 48 hours to glass panels treated with 50 mgm. DDT per sq. ft. the mortality of the strain from untreated areas was 93 per cent. males and 90 per cent. females, whereas the kill for the stock from the treated area was 31 per cent. males and 9 per cent. females. *C. M. Harrison*

Maelzer, D. A. & Kirk, R. L. **A Preliminary Study of the Genetics of DDT Resistance in Houseflies.** *Australian J. Biol. Sci.* 1953, May, v. 6, No. 2, 244–56, 2 figs. [15 refs.]

The DDT resistant strain of house-flies used for the crossing experiments described in this paper came from Illinois, U.S.A., and was resistant to a number of insecticides. The non-resistant strain from Canberra, Australia, gave the normal response when tested with applications of DDT in acetone at a series of concentrations. The Illinois strain on the other hand gave a linear log dosage-probit response up to concentrations of 4 μgm. of DDT per fly, but at higher concentrations there was little or no increase in mortality. Flies of this strain which were unable to withstand 4 μgm. of DDT were described as "weak" and flies which were unaffected by greater amounts of DDT as "strong". The most satisfactory method of separating "strong" and "weak" flies was found to be by applying a dose of 8 μgm. of DDT to the back of the thorax of flies and noting the time of knock-down. At this dosage all flies of the Canberra strain were knocked down within 2 hours whereas in the Illinois strain 10 per cent. were knocked down during the second hour and from the second to the sixth hour the knock-down rose steadily to 40 per cent. after which it remained approximately level for 24 hours.

The knock-down pattern of the F1 generation of crosses between "weak" Illinois flies and Canberra flies was unlike that of either of the parental stocks, but was intermediate between the parental stocks with no fly surviving longer than 6 hours. In the F2 generation a small number of flies survived more than 6 hours. This suggests that the inheritance of resistance of the "weak" type is controlled by multiple factors.

In the crosses between Canberra and "strong" Illinois flies there were 2 classes of results. Two crosses gave results compatible with the theory of single-factor inheritance, resistance being dominant since there was no mortality in the F1 generation. The other crosses of "strong" Illinois and Canberra flies gave a greater number of non-resistant than resistant flies in the F1 generation with segregation in the F2 generation giving approximately the numbers of non-resistant and resistant flies which would be expected if the parental Illinois flies were heterozygous.

The evidence suggests that there are 2 types of genetic constitution, the first being that resistance is under multifactorial control and the second type having a genetic constitution similar to the first but in addition having

some other factor enabling flies to survive applications of DDT from 4 to 96 μgm., and this is under the control of a single gene. There is also some evidence that flies carrying this gene are less fertile.

[This paper gives yet another possible solution of the genetical aspect of the DDT-resistance problem. The confusion in this problem is great, but the conflicting evidence given in various papers emphasizes the danger in drawing general conclusions from work on one resistant strain.]

C. M. Harrison

Bradbury, F. R., Nield, P. & Newman, J. F. **Amount of Gamma-Benzene Hexachloride picked up by Resistant Houseflies bred on a Medium containing Benzene Hexachloride.** [Correspondence.] *Nature.* 1953, Dec. 5, v. 172, 1052.

The experiments were made on 2 strains of houseflies; (a) a normally susceptible British colony and (b) a strain from Uruguay, resistant to γ BHC. This strain had been cultured in the laboratory in England for some generations in a medium containing 0·5 per cent. γ BHC to maintain its resistance. Three days after emergence, adult flies of each colony were exposed for different periods to deposits of carbon-14 labelled γ BHC on filter papers in Petri dishes. The rate of pick-up and penetration of the γ BHC was determined by (i) rinsing the flies with carbon tetrachloride to determine superficial γ BHC; (ii) grinding with anhydrous sodium sulphate and extracting in the same way, for internal insecticide. Both fractions were determined by combustion to CO_2 and conversion to barium carbonate for counting.

The results indicated much greater pick-up and penetration in the susceptible flies than in the resistant ones during the first hour or so; but the difference declined to equality at 4 hours (when the quantities were about 20 μgm. external and 30 μgm. internal, per gm. fly weight).

Since it was possible that the resistant flies already contained γ BHC transmitted from the larval stage, colorimetric chemical estimations were made on batches of 150 pupae and 150 flies. These indicated a γ BHC content of 40 μgm. per gm. in the pupae and 17 μgm. per gm. in the flies. This is enough to account for the slower initial adsorption in this strain.

These results indicate that (a) the resistance to γ BHC is not due to reduced penetration, and (b) a detoxification mechanism is unlikely, because the resistant flies maintained in their bodies, from larva to adult stage, enough γ BHC to kill normal flies in a few minutes. *J. R. Busvine*

Gustafson, C., Jr., Lies, T. & Wagner-Jauregg, T. **Action of some Aliphatic Thiocyanates against DDT-Resistant Strains of the House Fly.** *J. Econom. Entom.* 1953, Aug., v. 46, No. 4, 620–24. [13 refs.]

Resistant strains of house-flies have appeared which are virtually immune to a wide range of chlorinated insecticides. Therefore the authors have been investigating a range of organic thiocyanates for insecticidal action against resistant flies. Although the substances tested were not as effective as DDT, they were equally active against resistant and non-resistant house-flies. The substances were tested by exposing batches of flies in Petri dishes coated with residues from acetone solutions. After a 10-minute exposure, the numbers unable to fly were counted and the insects were removed to clean containers for 24-hour mortality counts. On the basis of knock-down activity and insecticidal action, the following general conclusions were drawn from the 13 samples tested :—

(i) Aliphatic thiocyanates (R.SCN) were not very effective. They were stable, but with objectionable odour.

(ii) Thiocyanohydrins (HO.R.SCN) were more active, but less stable and with repugnant odour.

(iii) On esterification of the hydroxyl group of thiocyanohydrins (R.COOR.' SCN) with lower aliphatic acids, substances are produced with fair knock-down and insecticidal action, to normal and resistant flies. These esters are stable, without objectionable odour and of relatively low toxicity to mice.

J. R. Busvine

Wichmand, H. **Control of Multi-Resistant Houseflies.** *Nature.* 1953, Oct. 24, v. 172, 758–9.

Practically all the flies infesting Danish farms had become resistant to chlorinated hydrocarbon insecticides by 1951, when the author began trying parathion for their control. It was considered too dangerous to spray this substance on the walls of stalls, pig sties, etc., and, furthermore, parathion would be rapidly hydrolysed by lime-wash which is commonly used in Danish stables. An alternative was to treat strips of a suitable material with parathion and hang them under the ceiling, like festoons. (Strips of metal screen treated with dieldrin have been used in this way in the U.S.A.; but this was considered too expensive in Denmark.) Laboratory and field investigations showed that strips of gauze (as used in bandages) were quite suitable. About 1 metre of gauze for each square metre of ceiling was found effective in reducing heavy fly populations to a negligible level; and the treated gauze remained highly effective, after 6 months in a room at 20°C.

Parathion-treated gauze strips have been in commercial production in Denmark since 1952. The strips are in 10 or 100 m. lengths, are 2·5 or 5 cm. wide and contain 0·5 or 0·7 gm. parathion per 10 cm. strip (2 or 2·8 gm. per sq. m.). In 1953 these strips were used on nearly 100,000 farms with the permission of the Danish Health Department, and no accidents have been reported.

J. R. Busvine

Bushland, R. C. & Hopkins, D. E. **Sterilization of Screw-Worm Flies with X-Rays and Gamma-Rays.** *J. Econom. Entom.* 1953, Aug., v. 46, No. 4, 648–56. [16 refs.]

This work was carried out to explore the possibility of controlling screw-worm flies (*Callitroga hominivorax*) in isolated natural populations by releasing large numbers of flies previously sterilized by irradiation with X-rays or gamma-rays. The equipment for both types of irradiation is fully specified. Deep-therapy equipment of a hospital sufficed for X-ray equipment; cobalt 60 was the source of gamma radiation and the treatment was administered with specially designed apparatus. Only pupae from laboratory-reared stocks were irradiated and observations were made on the longevity and sterility of the emergent adults. The results showed that X-rays and gamma-rays induced similar effects. Treatments to give total sterility in adults should not be less than 5,000 roentgens and applied not sooner than the fifth day of pupal development. There was no marked pupal mortality. Sterile males from irradiated pupae did not live quite as long as normal males, but this effect was not certain in female flies. After cross-mating of normal and irradiated flies, the females of the cross showed diminished oviposition including complete failure to lay eggs, and very few

of the eggs hatched. Gamma-irradiated males were observed to be about as competent as normal males in mating with the female flies.

D. S. Bertram

Wyniger, R. Beiträge zur Ökologie, Biologie und Zucht einiger europäischer Tabaniden. [**Ecology, Biology and Breeding of Some European Tabanids**] *Acta Tropica*. Basle. 1953, v. 10, No. 4, 310–47, 19 figs. [19 refs.]

Mitra, R. D. **Notes on Sand-Flies. Part V.** *Phlebotomus smithi* **n.sp.** *Indian Med. Gaz.* 1953, Sept., v. 88, No. 9, 473/5, 8 figs. on 2 pls.

Grenier, P. & Theodorides, J. Simulies (Dipt. Simuliidae) du Maroc. [**The Simuliidae of Morocco**] *Arch. Inst. Pasteur du Maroc.* 1953, v. 4, No. 6, 429–41, 3 figs. [11 refs.]

The authors briefly refer to the species of Simuliidae already recorded from North Africa and then give an illustrated description of a new species (*Cnephia blanci*) found in Morocco.

Short notes are included on other Simuliidae of Morocco: *Simulium bezzii*, *S. sergenti*, *S. aureum*, *S. equinum* var. *mediterraneum* and *S. ornatum* var. *nitidifrons*.

H. S. Leeson

Freeman, Paul & de Meillon, Botha. **Simuliidae of the Ethiopian Region.** pp. vii + 224, frontispiece & 68 figs. 1953. London: British Museum (Natural History). [50s.]

The present period has seen the publication of a number of valuable monographs on groups of biting insects, of which the present volume is an excellent example. Of the two authors, one works in Britain in the British Museum (Natural History) and the other in South Africa in the Institute for Medical Research, a very satisfactory arrangement, for the specimens and other valuable material are for the most part in either one or other of these institutions.

The introduction deals with the life history and habits, methods of collecting material and other points of general interest. In considering zoogeography it is pointed out that of all the species of *Simulium* which occur in the Ethiopian region, one only is known to occur outside the region. As the distribution of these insects is determined very largely by the existence of waters of specialized types, *Simulium* does not follow the principles which govern the distribution of other insects in the African continent. It would not form a good, general illustration of African zoogeography.

The section relating to medical importance and disease gives a good general account of the toxaemic symptoms which result from bites: also of the transmission of *Onchocerca* and of the entomological aspect of the blinding disease which it causes. The authors might perhaps have called attention to a significant point brought out by D. J. Lewis, that *S. damnosum* may be frequent and bite man in areas where onchocerciasis does not occur. This may be due only to the fact that the worm has not yet been introduced; but as the absence of the organism seems to be from places where the atmospheric humidity is very low, the phenomenon may probably be due to the fly not generally living long enough for the parasite to complete its cycle. For that event to occur and the transmission of the

Onchocerca to take place, it would seem that a high degree of atmospheric humidity at least at one season of the year is necessary.

The authors' discussion of the systematics of African *Simulium* is very interesting and should be studied by workers in other parts of the world. The females which are much more frequently collected may be extremely difficult or impossible to identify: most of the points of difference between species lie in the male genitalia or in the respiratory filaments of the pupa. These pupal structures may be extremely diverse, within a group of specimens which are not otherwise distinguishable. In such cases the present authors take a unitarian view, refusing for the moment to recognize species distinguishable only by pupal characters. Accepting that rather conservative view, there are at present 63 species of *Simulium* and 6 species of the related genus *Cnephia* known from the Ethiopian region.

The more specialized part of the book gives keys to species, technical descriptions on points of classification and descriptions of species. The general level of scholarship and of production is, as need hardly be said, very high. *P. A. Buxton*

Zeledón A., R. Manifestaciones alérgicas consecuentes a la picada de triatomas. (Hemiptera, Reduviidae.) [**Allergic Reactions Following bites of** *Triatoma dimidiata*] *Rev. Biologia Trop.* San José, Costa Rica. 1953, July, v. 1, No. 1, 17–20.

An account is given of local and general reactions of an allergic nature in a woman who had been exposed in her house to the bites of *Triatoma dimidiata*. One bug collected in the house was infected with *T. cruzi*, but xenodiagnostic tests of the woman and 2 daughters failed to demonstrate that they were infected. The daughters were also sensitive to the bite of *T. dimidiata*. Slight reaction followed bites of *T. infestans* but there was no reaction to *Rhodnius* bites. *D. S. Bertram*

Gramiccia, G. & El Din Sultan, G. Diversa risposta di *Pulex irritans* a polverizzazione di DDT e a spruzzamento di DDT emulsificabile in un esperimento pratico. [**Comparative Response of** *Pulex irritans* **to DDT Dust and DDT Spray**] *Riv. di Parassit.* Rome. 1953, July, v. 14, No. 3, 191–6, 2 graphs & 1 fig. English summary (3 lines).

In the course of an antimalarial campaign in the Lebanon, the inhabitants complained of large numbers of fleas, which were not reduced by DDT wall-spraying. The possibility of DDT resistance developing in the fleas occurred to the authors, who tested some control measures in 2 small villages, one having been sprayed annually with DDT 6 times and one unsprayed. Twenty houses in each village were selected, all being used promiscuously by human beings and animals as sleeping quarters. Numbers of fleas were estimated by traps, consisting of small lamps fixed in saucers of water. Fleas attracted by the light at night were caught in the water. Of the fleas caught, 98 per cent. were *Pulex irritans* and less than 2 per cent. *Ctenocephalides canis*. In each village, traps were set nightly in 10 houses and weekly in the other 10. Half of each group of 10 were treated with DDT and half were left as controls. Temperature during the trial varied from 12° to 21°C.

The treatments were applied to floor, walls, bed and bedding on the following dates:— 18th December, 1952 and 22nd January, 1953 (10 per cent. DDT powder applied with a hand dusting-gun), 25th February, 1953 (5 per cent. DDT emulsion sprayed at 2 gm. DDT per sq. m.).

The results in both villages were the same (giving no indication of DDT resistance in the fleas); also, the daily trapping of fleas did not appreciably reduce numbers as compared with the houses trapped weekly. The first 2 dust treatments of DDT had no effect, but the DDT emulsion reduced numbers to zero for 2 months. The emulsion base itself without DDT caused a temporary reduction for a few days. [See Shawarby, this *Bulletin*, 1953, v. 50, 1174.] *J. R. Busvine*

Lindquist, A. W., Roth, A. R., Hoffman, R. A., Yates, W. W. & Ritcher, P. O. **Chemotherapeutic Use of Insecticides for Control of Bloodsucking Insects.** *J. Econom. Entom.* 1953, Aug., v. 46, No. 4, 610–14.

" Studies on the chemotherapeutic use of insecticides for control of external parasites of warm-blooded animals were conducted at Summer Lake, Oregon, in 1952.

" White mice treated subcutaneously with peanut oil solutions of several insecticides (25 mg./K. except with lindane) were exposed to the deer fly *Chrysops discalis* Will. and mosquitoes, primarily *Aëdes dorsalis* (Meig.). Mice injected with dieldrin killed all the deer flies within several days. With one mouse, insecticidal action was recorded 16 days after treatment. Aldrin was slightly less effective than dieldrin when tested in the same manner. Neither insecticide gave such good results with mosquitoes (about 50-per cent kill in 36 trials over several days after treatment of the host), but heptachlor was more effective. Lindane gave inconsistent and poor mortality on both deer flies and mosquitoes. Little or no toxicity to deer flies or mosquitoes was obtained with DDT, TDE, methoxychlor, toxaphene, Q-137, the fluoro analog of DDT, the butyl analog of DDT, and a group of sulfones.

" Subcutaneous injections in cattle showed aldrin and dieldrin (25 mg./K.) to give poor kills of tabanids and mosquitoes. Allethrin at 100 mg./K. and heptachlor at 25 mg./K. were also comparatively ineffective. Lindane, however, at 50 and 75 mg./K. was toxic to mosquitoes up to 21 days after treatment. It was less effective against deer flies, 40- to 100-per cent mortality occurring for several days. Lindane was not very effective on other tabanids, but horn flies, *Siphona irritans* (L), were eradicated in the experimental herd of animals."

Craig, J. T., Tryon, P. F. & Brown, W. G. **Determination of the Gamma Isomer Content of Benzene Hexachloride by Chlorine-36 Isotope Dilution Method.** *Analytical Chemistry.* 1953, Nov., v. 25, No. 11, 1661–3, 3 figs.

Gallwitz, K. Neuere Untersuchungen an Stäubegeräten. [**Recent Investigations into Dusting Equipments**] *Staub.* Düsseldorf. 1953, Mar. 15, No. 31, 37–42, 6 figs.

A method is described of measuring the dust deposited at various distances from an insecticide spray. Glass plates 10 × 10 cm. in area are placed at varying distances from the spray; the deposit on each plate is analysed by a photometric method. The mass and size distribution of the dust deposited can be obtained as functions of distance from the spray.

Comparisons of these results for " Hexastaub " insecticide with the observed lethal effect on beetles, made by Brachmann, indicate that the toxic particles are, broadly, those greater than 20 μ in diameter.

Some investigations by JUNG are mentioned of the performance of a conventional dispenser for a dust spray; this depends to a large extent on the level of dust in the reservoir, and a new dispenser has been designed and constructed to overcome the difficulty. For this to produce a dust cloud of constant density a certain minimum air speed, proportional to the cloud density, must be exceeded; the limiting speed can also be expressed in terms of the mass of dust delivered per unit time. *R. L. Gordon*

REPORTS AND SURVEYS

COLONIAL OFFICE. **Colonial Research 1952–1953.** Colonial Insecticides, Fungicides and Herbicides Committee. Sixth Annual Report (1952–1953) [HALL, W. J., Chairman] (pp. 205–28). Cmd. 8971. 268 pp. 1953, Oct. London: H.M. Stationery Office. [7s. 6d.]

The Committee presents a report on the scientific and practical work. The document is itself condensed and general, and not easy to re-distill.

Certain parts of the work are evidently good. HADAWAY and BARLOW have considered insecticidal sprays both in solvents and in emulsions, investigating them in an analytical manner. It will be remembered that they have studied such matters as the sorption of insecticides on dry mud and the movement of DDT away from the surface to the deeper part of the mud brick, also practical ways of checking the resulting loss of insecticidal power. The same authors have worked with a wind tunnel at speeds of 1 to 2 miles an hour studying the deposition of airborne oil droplets. They have also carried out biological work on the particular habits and reactions of certain species of mosquitoes when brought into contact with insecticidal surfaces. Much of the work of these authors has been published, is available and generally recognized as good. The work on the eradication of *Anopheles* and malaria from Mauritius, and from certain test areas in Malaya, is also creditable and has been reported.

There is also much work which has been in progress for some years as may be seen by reference to earlier annual reports. What has been done with semi-permanent coatings of insecticides in resins is certainly of interest and to the credit of British science, but we cannot assess it or use it: one does not see why the work is done unless it is to be made available when it has reached a certain state of development. The same criticism applies to the work of the "Colonial Insecticide Research Unit" in East Africa. We know from a series of previous annual reports that this Unit has been engaged in spraying from aircraft, generally against tsetse. It is generously staffed in such a way as to carry out good work of a sound practical sort: the team consists of "4 entomologists, a physicist, a chemist, a senior executive officer and 9 European assistants". [We have not ascertained the cost of this; the present paper shows that the Colonial Research Council had an allocation of over 12 million pounds from 1941 to 1953, 7·5 per cent. of which went to the present Committee, *i.e.*, £900,000. As most of the work of the Committee does not appear to be expensive, we conclude that the air spraying may have cost about three-quarters of this sum. Work has been going on for a number of years and we judge from the one or two pages devoted to it in each annual report that much of it is good. Extremely little has yet been published and it looks as if the work will go out of date before it is made available, owing to development of

aircraft and improvements of technique. In other countries, work, probably less carefully planned and executed, is published and forms the basis of our present knowledge of insecticidal sprays against tsetse and mosquitoes. The position is unsatisfactory: the results should be put together in such a way that an editor would accept them, and then made available.] *P. A. Buxton*

United States. **Mutual Security Agency Mission to Greece. Medical and Sanitary Data on Greece.** Revised by Public Health Division, Mutual Security Agency Mission to Greece, June 1952 [Athens]. pp. vi + 107 mimeographed.

This Report contains a vast amount of information about recent developments in public health activity in Greece. The present central and peripheral health administration is described and an account is given of medical institutions, hospital facilities, medical and ancillary medical personnel and social services. There are notes concerning the prevalence of all the common and of most of the rare communicable diseases that occur or that have been reported in Greece, with special attention to diseases of military importance. There is a list of insects of importance in the transmission of disease with information about the most important of them. The vital and morbidity statistics quoted are often only approximations: accurate data were impossible to obtain during the years of enemy occupation and during the years that followed.

During the years of occupation, 1941–1944, the public health administration in Greece was largely disrupted. Malaria and tuberculosis became vastly more prevalent and famine conditions prevailed in several areas. Since the liberation of the country in October 1944 Greece has received an almost bewildering amount of foreign medical aid. Military Liaison (Allied) first rendered emergency medical care. UNRRA was next in the field and gave valuable help. Large quantities of food and medical supplies were brought in and a large staff of health officers, sanitary engineers, public health nurses, nutritionists, hospital administrators, medical supply experts and other personnel was sent to Greece. UNRRA's activities continued to the end of 1946. A small WHO mission, composed largely of former UNRRA personnel came next; it remained active till April 1949. In July 1947 the American Mission for Aid to Greece established a small Public Health Division which subsequently became the Public Health Division of the Economic Co-operation Administration to Greece [ECA]: at the end of 1951 this became the Public Health Division of the Mutual Security Agency [MSA]. This unit was recruited largely through the United States Public Health Service. Acting in an advisory capacity it has interested itself in reorganizing public health services, medical supply activities, construction of hospitals and health centres, improvement of water supplies, education of nurses, malaria control, tuberculosis control, the care of refugees, etc. It has provided scholarships for numerous Greek doctors, nurses and sanitary engineers for training abroad. In January 1952 when the ECA became the MSA the Public Health Division began to orientate its activities to conform with the military preoccupations of the MSA. Such considerations have been borne in mind in the compilation of this revised report.

Norman White

APPOINTMENT VACANT

UNIVERSITY OF EDINBURGH

Lectureship in Tropical Medicine

Applications are invited for the appointment on a part-time basis, of Lecturer in Tropical Medicine in the Department of Medicine. The Lecturer will be given an honorary appointment as a Consultant by the South-Eastern Regional Hospital Board, Scotland, with charge of the Tropical Diseases Unit at the Eastern General Hospital, Edinburgh. The salary will be £1500 per annum, with Superannuation Benefit.

The successful applicant will be expected to assume duty on 1st October, 1954.

Further particulars may be obtained from the undersigned with whom applications (8 copies), including the names of two referees, should be lodged not later than 31st March, 1954. A candidate from overseas may submit one copy of his application.

CHARLES H. STEWART
Secretary to the University

NOTICE

Langley Memorial Prize

The Langley Memorial Prize, value approximately £17, is open to competition among officers of the Colonial Medical Service who are serving, or who have served, in West Africa.

The prize will be awarded for the best paper submitted on one of the following subjects—special consideration being given to original work:—

(a) Tropical Medicine or Surgery.
(b) Tropical Hygiene and Sanitation.
(c) Tropical Entomology and Parasitology.

Joint applications will not be accepted. No officer who has been awarded the Prize is eligible to enter again.

Papers, which may consist of either published or unpublished work, should be sent to the Dean, London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London, W.C.1, not later than 1st October 1954.

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